PB85-249464

Superfund Record of Decision (EPA Region 8)
Woodbury Chemical, Commerce City, Colorado
July 1985

(U.S.) Environmental Protection Agency
Washington, DC

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U.S. Department of Commerce
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EPA/ROD/R08-85/003
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EPA

Superfund Record of Decision:

Woodbury Chemical, CO

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16. ABSTRACT

Woodbury Chemical Company operated a pesticide manufacturing facility at 54th Avenue and Jackson in Commerce City, Colorado, from the late 1950s to 1965 when the facility was destroyed by fire. Fire rubble and debris contaminated with approximately 1,565 pounds of organochloride pesticides were disposed on an adjacent empty lot which is the designated CERCLA site. Results of the remedial investigation show contaminated soils and sediments onsite, contaminated sediments offsite, and pesticides in the ground water; however, significant contamination is limited to the rubble piles. In addition, several separate investigations, conducted between October 1976 and June 1985, indicated three general types of contaminants: pesticides, metals, and other organic compounds.

The cost-effective selected remedial action for this site includes: excavation and offsite transport, incineration, and ash disposal of highly contaminated rubble (total pesticide concentration in excess of 100 ppm) at an EPA approved incineration/disposal facility; excavation and offsite disposal of contaminated soils, to a cleanup level of 3 ppm total pesticide concentration, at an EPA approved facility; backfilling with clean soil, regrading and revegetating the site; and ground water monitoring and site maintenance for a three-year period. Total capital cost for the selected remedial alternative is estimated to be $1,417,000, which includes $21,000 for a three year O&M period.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field Gr...
Record of Decision Woodbury Chemical, CO Contaminated Media: soil, sediments, gw Key contaminants: pesticides, heavy metals, organics		

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Record of Decision
Remedial Alternative Selection

SITE: Woodbury Chemical, Commerce City, Colorado

DOCUMENTS REVIEWED

I am basing my decision primarily on the following documents describing the anlysis of cost-effectiveness of remedial alternatives for the Woodbury Chemical site:

- Woodbury Chemical Remedial Investigation, CH2M Hill
- Woodbury Chemical Feasibility Study, CH2M Hill
- Summary of Remedial Alternative Selection, EPA
- Responsiveness Summary, EPA
- Summary of Remedial Alternatives, Camp, Dresser, & McKee
- Other miscellaneous documents and correspondence in the project file

DESCRIPTION OF SELECTED REMEDY

The selected remedy consists of excavation and offsite transport, incineration, and ash disposal of highly contaminated rubble at a total pesticide concentration above 100 ppm (250 cubic yards) at an EPA approved incineration/disposal facility, and offsite transport and disposal of remaining contaminated soils to a cleanup level of 3 ppm total pesticide concentration (5470 cubic yards) at an EPA approved facility. There will be soil replacement using clean, impermeable fill material, along with regrading, revegetation, and monitoring.

The operation and maintenance requirements of this remedy include development of a vegetative cover on the site over three years, and groundwater monitoring for a minimum of three years.

DECLARATIONS

Consistent with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), and the National Contingency Plan (40 CFR Part 300), I have determined that the offsite incineration of highly contaminated rubble and offsite disposal of remaining contaminated soils at the Woodbury Chemical Site is a cost-effective remedy and provides adequate protection of public health, welfare, and the environment. The State of Colorado has been consulted and agrees with the approved remedy. In addition, the action will require future operation and maintenance activities to ensure the continued effectiveness of the remedy. These activities will be considered part of the approved action and eligible for Trust Fund monies for a period of one year.

I have also determined that the action being taken is appropriate when balanced against the availability of Trust Fund monies for use at other sites. In addition, the off-site transport, destruction, and secure disposition of contaminants is more cost-effective than other remedial action, and is necessary to protect public health, welfare, and the environment.

The EPA will undertake additional studies as necessary to determine the extent of groundwater contamination in Commerce City, Colorado. If additional remedial actions are determined to be necessary a Record of Decision will be prepared for approval of the future remedial action.

JUL 19 1985

Date

John G. Welles
Regional Administrator
U. S. Environmental Protection Agency
Region VIII

SUMMARY OF REMEDIAL ALTERNATIVE SELECTION
Woodbury Chemical Site

Site Location and Description

The Woodbury Chemical site is a National Priorities List (NPL) site under CERCLA (Superfund) that has been contaminated by various organochloride, organophosphate, and heavy-metal pesticides. The site is located at 54th Avenue and Jackson Street in Commerce City (immediately north of Denver), Adams County, Colorado (Figure 1). The Woodbury Chemical Company operated a pesticide formulation facility at 54th Avenue and Garfield Street between the late 1950's and 1965.

In 1965, the facility was destroyed by fire. The debris and rubble from the fire were disposed of on an adjacent 2.2 acre vacant lot to the east at the 54th and Jackson Street location. The disposal site is a flat vacant lot approximately 550 feet long (E-W) by 175 feet wide (N-S) (Figure 2). A number of rubble piles that resulted from disposal of the Woodbury facility are located on the site to a height of approximately four feet. Vegetation, primarily grasses and weeds, covers the majority of the site, with the rubble piles and portions of drainage ditches remaining unvegetated.

Several man-made drainage channels on the site drain intermittent stormwater runoff off-site to the north and west. The runoff from the channels discharges into a drainage ditch that runs along the northern boundary of the site in a westerly direction for about 3,000 feet before emptying into a retention pond. Water loss from the pond occurs via evaporation and infiltration. The South Platte River is located approximately 1 mile to the northwest of the site. Sand Creek, a tributary of the South Platte, runs east-west about 0.5 miles north of the site.

The Commerce City area is heavily industrialized. The site is surrounded by light and heavy industries on all sides, with the Foremost-McKesson Chemical Company (a solvent and etching solution distributor located on the

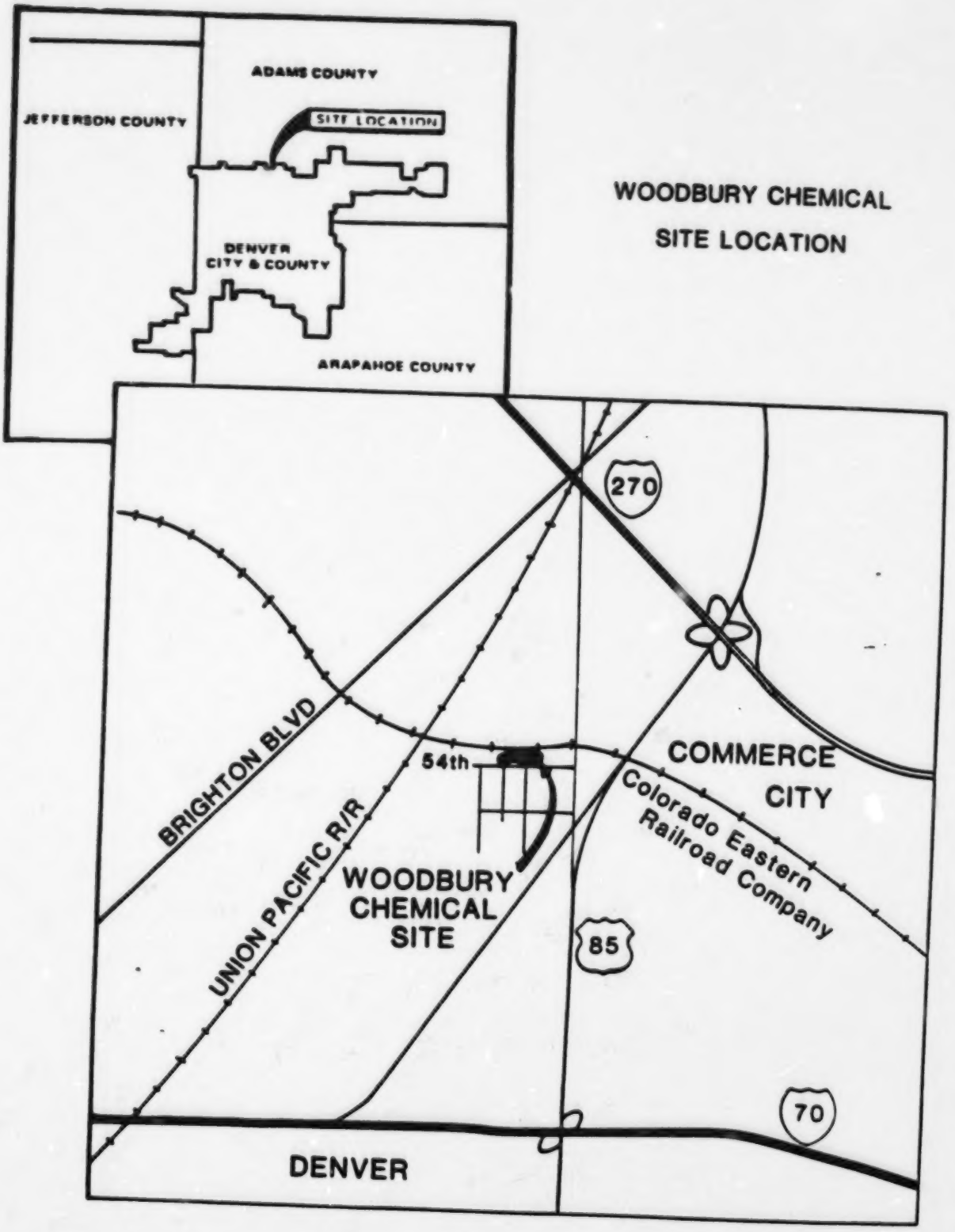
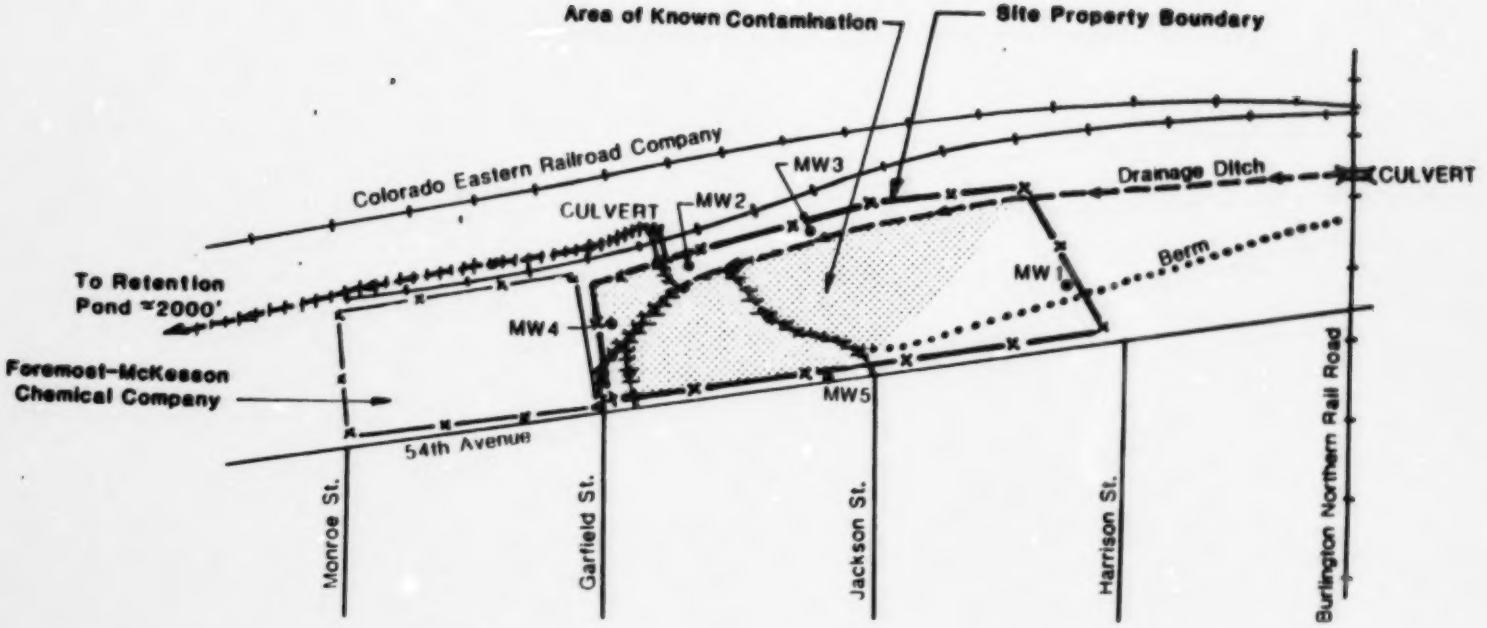


Figure 1 Regional Location of Woodbury Chemical Site



SITE PLAN

1" - 200'

MW Monitoring Well

Figure 2 Site Plan of Woodbury Chemical Site

CDM

former Woodbury property) to the west, a petroleum refinery and railroad tracks to the north, a railroad and highway to the east, and several automobile and scrap metal salvage yards to the south. Tracks of the Colorado Eastern Railroad Company (CERC) run east-west approximately 50 feet north of the site at a grade 20 to 25 feet below the site ground surface.

The ground water hydrology of the area is characterized by unconfined aquifer conditions in the alluvium and semi-confined aquifer conditions in the underlying bedrock which lies at a depth of about 30 feet. The water table is located 20-27 feet below the ground surface. The general direction of ground water flow is to the west and northwest, towards the South Platte River.

Thirty industrial or residential wells are identified in the state engineers' records as being downgradient (west to northwest) of the Woodbury site, between the South Platte and the site. Nineteen of these wells receive ground water from the surface aquifer and eleven from the bedrock aquifer. The nearest downgradient well completed in the surface aquifer is 0.5 miles away. The South Platte provides recharge to alluvial municipal drinking water wells serving portions of the Denver Metro area. It is also used for irrigation.

The closest residential area is a mobile home park about 0.3 miles to the southwest. The population within 1 mile of the site is approximately 3,000.

Site History

The Woodbury Chemical Company was operated as a pesticide formulation facility at 54th Avenue and Garfield Street in Commerce City between the late 1950's and 1965. In 1965, the facility was destroyed by fire with debris and rubble being disposed of on the existing CERCLA site. No records have been located regarding the type of pesticides actually formulated by Woodbury. After the 1965 fire and subsequent disposal of rubble on the site, no actions were taken at the site until 1976 when, in

response to concern about runoff from the site being contaminated with pesticides, the Tri-County Health Department sampled storm runoff. Subsequently, the soil, surface water, and ground water were sampled by a number of local, State, and Federal agencies from 1979 through the Remedial Investigation field work in 1985. The site has not been used or modified since 1965 except for a Superfund Immediate Removal action in September 1983, which consisted of the installation of a six-foot chain link and barbed wire fence around the perimeter of the site. Five monitoring wells were installed along the perimeter of the site by EPA in 1984 as part of EPA's Remedial Investigation.

Shortly after the 1965 fire, the Woodbury Chemical Company rebuilt a facility at the original location (adjacent to the CERCLA site). The property and building were sold in 1970 to the present owner, Foremost-McKesson Chemical Company. The CERCLA site was owned by the Chicago, Rock Island, and Pacific Railroad Company (CRIP) at the time of the fire and until 1984. However, in March 1975, CRIP filed for reorganization under the Federal Bankruptcy Act. After operating in receivership for over nine years, on June 1, 1984, the entire proceeds of CRIP were liquidated and the Woodbury CERCLA site became a property of the Chicago-Pacific Corporation. In December 1984, the property encompassing the Woodbury site as well as many other former holdings of CRIP were sold by the Chicago-Pacific Corporation to Colorado Eastern Railroad Company (CERC), a small Colorado short line railroad.

Current Site Status

Information regarding contamination at the Woodbury Chemical site was obtained from several separate investigations conducted between October 1976 and June 1985 (Table 1). These investigations indicated three general types of contaminants: pesticides, metals, and other organic compounds. Of these, the pesticides and one metal, arsenic, are attributed to the Woodbury Chemical wastes disposed of on the site. A listing of the maximum levels of contaminants found at the Woodbury site are presented on Table 2. The concentrations presented are the "worst case" maximums found over the sampling period 1976 to 1985. These high concentrations within the soils

TABLE 1

SUMMARY OF SAMPLING EFFORTS

Date	Samples Collected	Chemical Analyses Performed	Taken By
October 21, 1976	1 Standing water	PP, AP	TCDHD
April 23, 1979	11 Soil	PP, AP	TCDHD, CDH
August 14, 1979	3 Surface runoff	PP, AP	EPA, E&E
November 19, 1979	10 Soil, 1 Pond	PP, AP	EPA, E&E
February 21, 1980	3 Water	PP, AP	EPA
May 10-20, 1982	26 Borehole 34 Soil 10 Surface Water 7 Ground water	PP, PI, AP	FCHA
June 26 - Aug. 1, 1984	8 Surface soil 7 Surface water 7 Ground water 21 Borehole soil	PP, PI, PO, PV AI, AO	CH_2M Hill
November 14, 1984	7 Ground water	PP, PI, PV	CH_2M Hill
June 10- June 14, 1985	10 Rubble 66 Rubble/soil 26 Soil 12 On-site sediment 10 Off-site sediment 3 Off-site soil	PP, AP	E&E

TCDHD--Tri-County District Health Department
CDH--Colorado Department of Health
EPA--Environmental Protection Agency, Region VIII
E&E--Ecology and Environment, Inc., FIT Contractor
FCHA--Fred C. Hart Associates, Inc., FIT Contractor
PP--Priority Pollutant Pesticides
PI--Priority Pollutant Inorganics
PO--Priority Pollutant Organics (Base/Neutral and Acid Extractable)
PV--Priority Pollutant Volatiles
AP--Additional Pollutant Pesticides
AI--Additional Pollutant Inorganics
AO--Additional Pollutant Organics (Base/Neutral, Acid Extractable, and Volatile)

TABLE 2

MAXIMUM CONTAMINANT LEVELS OBSERVED AT THE WOODBURY CHEMICAL SITE

Contaminant	Rubble/ Soil/Sediment (ppm)	Ground Water (ppb)	Surface Water (ppb)
Pesticides			
Aldrin	1,200	-	7.3
Dieldrin	88	2.2	5.0
Chlordane	380	-	-
4,4'-DDT	400	0.2	25.3
4,4'-DDE	200	-	3.9
4,4'-DDD	1.9	-	-
Endrin	447	-	4.2
Heptachlor	103	-	-
alpha-BHC	152,000	0.2	2.4
beta-BHC	57	0.2	-
gamma-BHC	55,000		1.8
delta-BHC	43	0.2	-
Toxaphene	7,100	-	-
2,4,5-T	-	-	0.89
Malathion	68	-	30.3
Methoxychlor	116	-	5.2
Parathion	41	-	9.7
Metals			
Arsenic	33	-	496
Cadmium	10	7.9	65
Chromium	33	-	72
Lead	263	-	456
Zinc	244	43	901
Barium	275	107	-
Iron	32,600	-	-
Manganese	1,200	3,240	1,130
Vanadium	39	-	-
Volatile Organic Compounds			
1,1-Dichloroethane	-	243	-
1,1,2-Trichloroethane	-	1,300	-
Chloroform	-	1,300	-
Methylene Chloride	0.1	7	-
Tetrachloroethylene	-	50	-
Toluene	-	88	-
Trichloroethylene	-	280	-

TABLE 2

MAXIMUM CONTAMINANT LEVELS OBSERVED AT THE WOODBURY CHEMICAL SITE

Contaminant	Rubble/ Soil/Sediment (ppm)	Ground Water (ppb)	Surface Water (ppb)
Base-Neutral Extractable Organic Compounds			
Di-n-butyl phthalate	0.61	-	-
Di-n-octyl phthalate	2.7	-	-
Benzo(a)anthracene	0.62	-	-
Chrysene	0.62	-	-
Pyrene	0.94	-	-
Acetone	15.0	150	-

and sediments are not found throughout the site, but only in "hot spots" where rubble had been deposited. The volatile and extractable organics (solvents) found at the site are attributable to off-site sources which are currently under investigation by EPA.

The pesticides found at the Woodbury site can cause a wide variety of adverse health effects, ranging from dermal irritation to cancer (Table 3). The persistence of the organochloride pesticides (DDT, methoxychlor, aldrin, heptachlor, chlordane, dieldrin, toxaphene, and endrin) and their ability to bio-accumulate are widely known. Potential routes of migration or exposure to the pesticides on site include direct human or animal contact with the soils, sediment, wind-transported soil particles, migration to ground water, or migration to surface water.

Contamination by the pesticides has occurred, at least to some extent, in four environmental media: soils, sediments, ground water, and surface water. Of these, contamination of soils and sediments is considered the most significant. A brief discussion of contamination in each medium is presented below:

- o Soils: Investigations at the Woodbury site indicate that pesticide contamination occurs in "hot spots" in the central portion of the site (i.e., individual accumulations of disposed demolition rubble). Samples taken from soil borings (MW2 and MW3 - monitor wells installed during the 1984 investigations) indicated pesticide contamination of soils with depth. At MW2 contamination was noted throughout the 35 foot depth with alpha-BHC detected at a concentration of 0.65 ppm at about 30 feet. In MW3 pesticides were noted to a depth of 32 feet; toxaphene was detected at 12.0 ppm in the upper 10 feet of soil. At sample point RSO-8 (1985) a total pesticide level of 35.12 ppm was detected at 10 feet; toxaphene accounted for 60 percent of total pesticides in this sample. At RSO-10 (1985) total pesticides concentrations of 2 to 4 ppm were found at depths ranging from 10 to 30 feet; toxaphene was the only pesticide that occurred at concentrations exceeding 1 ppm.

  These findings indicate that some downward migration has occurred. Possible explanations for the observed subsurface contamination include dissolution and migration through the unsaturated zone with re-adsorption onto the soil particles, or cross-contamination within the boring during drilling or sampling. Even if the pesticides have migrated vertically downward through the soil, they do not appear to have dissolved into the ground water in large amounts.

TABLE 3

KNOWN OR SUSPECTED RISKS OF CONTAMINANTS
AT THE WOODBURY CHEMICAL SITE

Contaminant	Chemical Form[a]	Type of Material	Risks[b]
Aldrin	1,2,3,4,10,10-hexacholoro-1,4,4a,5,8,8a-hexahydro-exo-1,4-endo-8-dimethano-apthalene	Broad spectrum insecticide; chlorinated hydrocarbon	Can be absorbed through skin, respiratory tract, ingestion. Affects central nervous system, liver, kidney, and skin. Classified as a carcinogen by the National Cancer Institute, EPA, USDHHS, IARC. Breaks down to dieldrin.
Arsenic	Arsenic trioxide in nature	Typically in the pentavalent form in wood preservative solution and in preserved wood.	Usually inhaled or ingested through dust or fumes. Effects include skin corrosion and and dermatitis, perforation of the nasal septum, and keratosis. Prolonged contact can result in vomiting and later vascular or pustular eruptions. Listed as a carcinogen by EPA, USDHHS, IARC.
Chlordane	1,2,4,5,6,7,8,8-octachloro-2,3,3a,4,7,7a-hexachloro-4,7-methanoindane	Pre-plant insecticide used to control fire and harvester ants; chlorinated hydrocarbons.	Can enter body through ingestion, inhalation, or skin absorption. Acute toxicity, primarily due to alteration of the central nervous system, includes diarrhea, vomiting, deep depression, and death. Chronic effects include degeneration of the liver, severe necrotizing, bronchopneumonia, and degeneration of renal tubul epithelium. Classified as a carcinogen by NCI, EPA, USDHHS, IARC.

TABLE 3

KNOWN OR SUSPECTED RISKS OF CONTAMINANTS
AT THE WOODBURY CHEMICAL SITE
(CONT'D.)

Contaminant	Chemical Form[a]	Type of Material	Risks[b]
DDT	1,1,1-trichloro-2,2-bis(p-chlorophenyl) ethane	Broad-spectrum insecticide.	Can be absorbed through the skin, ingestion or inhalation. Acute affects include tremors of the head and neck muscles, tonic and clonic convulsions, cardiac or respiratory failure, and death. Chronic effects include hepatic damage, central nervous system degeneration, agranulocytosis, dermatitis, weakness, convulsions, coma, and death. Carcinogenic assays are inconclusive.
DDD, DDE	Metabolites of DDT	Dehydrochlorinated form of DDT	Attacks central nervous system, liver, kidneys, skin and peripheral nervous system.
Dieldrin	1,2,3,4,10,10-hexachloro-6,7,epoxy-1,4,4a,5,6,7,8, 8a-octahydro-endo, exo-1,4:5,8-dimethanonaphalene	Chlorinated hydrocarbon pesticide; formed from the metabolic conversion of of aldrin.	Absorbed from the gastrointestinal tract and transported to the blood, brain, and liver. Toxic symptoms include headache, dizziness, nausea, malise, vomiting, muscle twitching, myoclonic jerks and convulsions. Other symptoms can include stimulation hyperactivity, intoxication and depression. A suspected carcinogin.
Endrin	1,2,3,4,10,10-hexachloro-6,7-epoxy-1,4,4a,5,6,7,8, 8a-octohydro-1,4-endo endo-5,8, dimethanon-aphthalene	A cyclodiene insecticide used on cotton fields and vegetable crops, and as a rodenticide against mice and chipmunks.	Can enter body through inhalation, ingestion, or absorption through the skin. Attacks the liver and central nervous system. Acute effects include headaches, dizziness, abdominal discomfort, nausea, vomiting, insomnia, mental confusion, epileptiform convulsions, stupor, and death. Not considered a carcinogen.

TABLE 3

KNOWN OR SUSPECTED RISKS OF CONTAMINANTS
AT THE WOODBURY CHEMICAL SITE
(CONT'D.)

Contaminant	Chemical Form[a]	Type of Material	Risks[b]
BHC	alpha-, beta-, delta-, gamma isomers of hexachloro-cyclohexane	Insecticide used to control insects on livestock and pets as well as lice, mosquitos, and flies resistant to DDT. Also used for medicinal purposes in vaporizers, creamers, lotions, and shampoos	Exposure may occur dermally, orally, or through inhalation. Symptoms resulting from over-exposure include seizures, muscle spasms, weakness convulsions and, in the most severe cases, death. Other symptoms include liver and kidney and pancreas damage, muscle necrosis, vomiting, and headaches. BHC isomers have been determined to present an increased cancer risk.
Toxaphene	Composed of a mixture of camphene derivatives	Chlorinated hydrocarbon insecticide	Can enter body through ingestion, inhalation, or skin absorption. Attacks the central nervous system. Acute reactions include salivation, spasms, nausea, vomiting, hyperexcitability, tremors, convulsions, and tetanic convulsions of all skeletal muscles. Pathological effects of acute poisoning consist of petechial (skin or mucous membrane) hemorrhages and congestion in the brain, lungs, spinal cord, heart, and intestines. Pulmonary edema (fluid on the lungs) and focal areas of degeneration in the brain and spinal cord can also can be expected. Chronic effects are limited to central nervous system excitation and liver degeneration. Data on carcinogenity are inconclusive.

[a] Chemical forms presented as synonym or equivalent.
[b] Determined as a carcinogen by National Cancer Institute (NCI), EPA, U.S. Department of Health and Human Services (USDHHS), or IARC.

Elevated levels of arsenic were observed on-site. Arsenic levels above background were observed in some off-site soils. Soil boring samples gave no indication of elevated inorganic constituents in the soil at depth on the site.

- Sediments: Pesticides were detected in samples of drainage ditch sediments in the 1984 and 1985 studies, on- and off-site to approximately 1,200 feet west. Pesticide contamination at these locations are likely a result of movement from sources on-site. Possible off-site sources other than Woodbury also could account for pesticides observed. Elevated levels of arsenic were observed in the drainage ditch sediments on-site. No inorganic constituents were found above background levels in the off-site downstream drainage ditch sediments in either the 1984 or 1985 sampling.

- Ground Water: The hydrogeology of the area is characterized by unconfined aquifer conditions in the alluvium and confined or semi-confined aquifer conditions in the underlying Denver and Arapahoe Formations.

  The confining layers of shale and claystone are occasionally discontinuous in both the Denver and Arapahoe Formations. Field investigations indicate that the water table is 20 to 27 feet below the ground surface at the site and that the saturated zone of alluvium is approximately 10 feet thick. A confining layer is indicated at 30 to 35 feet.

  The ground water level has been rising in recent years in response to urban development in the area. This rise is expected to continue into the next century.

  Earlier investigations (prior to 1984) found no pesticide contamination in wells which tap the unconsolidated alluvial aquifer. However, in July 1984 pesticides were found in two of the five wells monitored (MW3 and MW5). Dieldrin (0.3 ug/l) and 4'4' DDT (0.2 ug/l) were observed in MW5 and dieldrin (2.2 ug/l), alpha-BHC (0.2 ug/l), beta-BHC (0.2 ug/l), and delta-BHC (0.2 ug/l) were observed in MW3. In November 1984, pesticides were observed only in MW4 (dieldrin, 0.17 ug/l; delta-BHC, at 0.06 ug/l) and in the blank sample (gamma-BHC, 0.11 ug/l).

  Pesticides observed in the ground water at on-site wells in July 1984 were not found in the ground water at the same wells in November 1984. This observation indicates that pesticide contamination in the ground water is limited, and may be affected by a discontinuous source, a limited size of the plume, or possible sample contamination.

  The nearest downgradient well completed in the surface aquifer is 0.5 miles away to the northwest. Several organic solvents (TCE and others) were observed in most of the ground water samples, reflecting the general low-level contamination of ground water in the Commerce City area. Sampling results indicate that elevated levels of arsenic, lead, and zinc were present in 1979 in the soil

on-site. However, these inorganic contaminants do not presently appear to be migrating from the site.

- Surface Water: The surface waters at the Woodbury site consist of intermittent storm runoff, which flows through the site via three major drainage channels before emptying into a retention pond 0.5 miles west of the site. Major waterways nearby include Sand Creek 0.5 miles northeast of the site, and the South Platte River 1 mile to the northwest.

  The major inorganic constituents observed at elevated levels in the surface water appear to be as high upstream or on-site as downstream in the drainage ditch. This contamination may be attributable to industrial sources upstream. The 1979 investigations indicated that surface water in the drainage ditches was contaminated by pesticides. The highest concentrations were for DDT (25.3 ug/l) and malathion (30.3 ug/l). Endrin (< 4.2 ug/l) was observed to exceed its primary drinking water standard of 0.2 ug/l. One water sample was collected in 1979 from the stormwater retention area located approximately 3,000 feet west of the site. Dieldrin, endrin, and DDT were detected in the range of 0.15 to 0.3 ug/l.

  The 1980 study did not reveal any detectable levels of pesticides. The 1982 sampling resulted in concentrations of arsenic, cadmium, lead, and chromium above primary drinking water standards at various locations upstream of, downstream of, and on the site. DDT was detected (in the 1982 study) in one sample at a level of 4.15 ug/l. No other pesticides were detected in the surface water samples during 1982. In the 1984 study, several surface water samples were taken. Lead was the only element found in all seven samples at concentrations above the 50 ug/l primary drinking water standard. Cadmium exceeded the 10 ug/l primary drinking water standard only at the upstream sample.

  The highest levels for all of the major inorganic contaminants were observed at two upstream sample locations. The results of the analyses for organic constituents in the surface water indicated little contamination by pesticides. Dieldrin, endrin, and 4'4' DDT were observed at concentrations of 0.2 ug/l. The level of endrin is equal to the primary drinking water standard.

The closest residential area is a mobile home park about 0.3 miles to the southwest. The population within 1 mile of the site is approximately 3,000. The nearest downgradient well completed in the surface aquifer is 0.5 miles to the northwest. The ground water use in the area is projected to increase dramatically over the next 30 years. The South Adams County Water and Sanitation District presently serves the undeveloped portions of the northeast Denver area. The district currently operates approximately 12 alluvial wells and 8 bedrock wells, some of which are within a one mile

distance from the site. These wells currently serve approximately 30,000 people. Several new wells have been proposed and the district anticipates a service area of 150,000 people within the next 30 years. As stated earlier, the South Platte River is downgradient from the site. The river serves as a source of recharge to alluvial aquifers that are presently used for public water supply for northeast Denver.

Enforcement

Region 8 has determined that the possibility of participation by potentially responsible parties in the project is minimal. Woodbury Chemical Company was a family owned company at the time of the fire in 1965. Subsequent to the fire and the placement of the fire debris in its current location, both the Woodbury Chemical property and company were sold in separate transactions to separate parties. The company ultimately was sold to Farmland Industries. The Woodbury Chemical Company no longer exists. As for the property where the debris is located (the CERCLA site), the owner at the time of the fire was Chicago, Rock Island, and Pacific Railroad. In 1975, the railroad filed for reorganization under the Bankruptcy Act. In June 1984, all of the assets of the railroad were liquidated and the Woodbury property was sold to the Colorado Eastern Railroad Company as part of a large transaction. Colorado Eastern is on notice of this project, but has indicated that it does not have the financial resources to participate in the project. Both Colorado Eastern's and Farmland Industries' liability will be evaluated further when the Agency reviews its cost recovery options at the end of the project.

Because there is little likelihood of participation in the project by a financially viable PRP, EPA assumes that the Hazardous Substances Fund (Superfund) be used to finance remedial action.

Pollutant Limit Value

To establish a basis for determining an effective remedial action, pesticide cleanup levels were evaluated and delineated based on the following considerations. The results of prior field investigations show

several areas of significantly contaminated material covering or adjacent to less contaminated materials (i.e., "hot spots"). The range of concentrations across the site is large, from below detection limits of the analytical equipment to up to 151,515 ppm. The higher concentrations were in samples from rubble piles and it is these piles and adjacent contaminated soils that present a hazard to the human health and the environment. Once contaminated soils are removed or controlled down to a certain concentration level, the EPA assumes this threat to be removed.

The pesticides present on the Woodbury Chemical Site are those that were available for use in the urban environment during the 1960s through the mid-1970s to control a variety of pests. Residual soil concentrations (i.e., pesticides remaining in soils following application) were detected in the soils of most U.S. cities during the 1970s. A review of the literature indicates no adverse health or environmental effects from residual pesticides in urban soils. Therefore, the following criteria were used to select the appropriate residual pesticide concentration, (Proposed Pollutant Limit Value - PPLV), for cleanup of the Woodbury Site:

1) "Typical" Residual Soil Concentrations in Urban Areas
2) RCRA Standards
3) Potential Cancer Risk

Only organochloride compounds were used to develop the PPLV. Organophosphate compounds have a significantly shorter half-life and EPA assumes that any residual organophosphate concentration would rapidly degrade. These assumptions are verified by the observations that only organochloride compounds were found below a depth of 5 feet.

Residual Soil Concentrations - Summary data for the period 1969-1976 from the National Soils Monitoring Program were used to develop the pesticide cleanup level. Five cities with sufficient urban soils data were selected to represent a western or Great Plains urban environment: Cheyenne, WY; Salt Lake City, UT; Manhattan, KS; Sioux City, IA; and Bakersfield, CA. Specific data for the Denver urban area are not available. For each of the five cities, data on chlordane, heptachlor, heptachlor epoxide, dieldrin, endrin, toxaphene, and total DDT (DDT+DDE+DDD) were obtained. Aldrin data were not available for these five cities, therefore data from Cary et al

(1979) were utilized. The National Soils Monitoring Program did not monitor lindane so data from Edwards (1973) were used to establish a baseline for this compound.

The results of the data review are presented in Table 4. This table sums the ranges of minimum, maximum, and mean values for the pesticides of interest and shows values of 0.08-0.90 ppm (minimum), 10.74-51.04 ppm (maximum), and 0.33-2.46 ppm (mean). Maximum values were dropped from consideration because these values resulted from abnormally high applications of pesticides.

After consideration of the range of residual pesticide concentrations in soils, the value of 3.0 ppm was selected as a reasonable level for a criteria cleanup concentration for total pesticides. This value was selected because it appears to typify an average urban total pesticide soil concentration based on the data reviewed.

RCRA Standards - The cleanup value of 3.0 ppm represents the total residual pesticide concentrations in soil. By volumetric calculation, the 3.0 ppm pesticide concentration will result in 5.0 Kg of total pesticide remaining on the 2.2-acre site. Utilizing this volume, the potential delivery of pesticides to the alluvial aquifer (at 20 feet) was calculated. The bases for the calculations are as follows.

- Relative Concentrations of Pesticides in the Soil. From past analytical results toxaphene was found to comprise approximately 90 percent of the total pesticides, chlordane approximately 3 percent, and all others 1 percent or less.
- Solubility of Pesticides. The values were taken from published data and were selected and utilized to represent the most realistic conditions.
- Pesticide Half-Lives. Values from current literature were obtained for the half-life for each pesticide. These values were integrated with the calculated travel time to estimate degradation.
- Recharge to Site. This constituted a water balance that considered net precipitation and permeability of the soil. Modified Darcian equations were used to estimate recharge.

TABLE 4

SUMMARY OF URBAN SOIL, PESTICIDE DATA USED TO SELECT THE PPLV FOR THE WOODBURY CHEMICAL SITE

(Values ug/g)

Chemical	Ranges of Values		
	Minimum	Maximum	Mean
Chlordane	0.01-0.30	0.15-20.48	0.02-0.78
Aldrin	0.01-0.03	0.64-2.04	0.01-0.02
Dieldrin	0.01-0.01	0.06-4.17	0.01-0.12
Toxaphene	0.01-0.37	9.57-12.07	0.24-0.45
Heptachlor	0.01-0.02	0.09-0.24	0.01-0.01
Heptachlor epoxide	0.01-0.05	0.06-0.44	0.01-0.03
Endrin	0.01-0.06	0.03-0.06	0.01-0.01
DDT sum (DDT+DDE+DDD)	0.01-0.06	0.09-10.08	0.01-0.78
Lindane	NA	0.05-1.40	0.01-0.26
TOTAL	0.08-0.90	10.74-51.04	0.33-2.46

Source: Aldrin - Carey et al. (1979)
Lindane - Edwards (1973)
All others - National Soils Monitoring Program (unpublished data)

- o Dilution by the Alluvial Aquifer. This factor was considered in the delivery calculations and included such characteristics as permeability, transmissivity, and storativity.

Empirically-derived adsorption equations were used to calculate the concentrations in the water within the alluvial aquifer at the site boundary, at a soil concentration of 3 ppm. Concentrations were calculated for toxaphene, chlordane, and dieldrin, as these materials represent maximum concentration (toxaphene-90%), relatively high concentration (chlordane-3%), and concerns over toxicity (dieldrin-cancer risk). For comparative purposes, similar calculations were made for soil total pesticide concentrations of 1 ppm, 5 ppm, and 10 ppm. Table 5 shows each of these three pesticides, water quality criteria (refer to Table 5 for definition of water quality criteria) and cancer risk, soil pesticide concentration levels, and calculated concentrations of each pesticide in the alluvial aquifer at the site boundary.

Of the three substances, only toxaphene has a specified RCRA concentration. RCRA standards allow for a toxaphene level of 0.005 mg/l at the point of compliance (i.e., directly outside of site boundaries) [40 CFR 264.94(a)(1)]. The calculated water concentration of 35 ng/l at a 3 ppm soil pesticide concentration is more than two orders of magnitude less than the RCRA concentration limits.

Potential Cancer Risk - Review of Table 5 indicates that cleaning to a 3.0 ppm residual pesticide concentration in the soil will result in a minimal impact to the underlying aquifer. The EPA document; "Guidance on Feasibility Studies on CERCLA," (released June 1985), suggests a 10^{-6} target cancer risk factor while allowing an acceptable range of cancer risk factors from 10^{-4} to 10^{-7}. Contamination from two of the three pesticides of concern (chlordane and dieldrin) will be attained to the target level of acceptable cancer risk (less than 10^{-6}). Toxaphene, at 3.5×10^{-5}, is well within the acceptable range of cancer risk levels of 10^{-4} to 10^{-7}. In addition, research data on the carcinogenity of toxaphene have not conclusively proven it is a carcinogen.

TABLE 5

COMPARISON OF SOIL CONCENTRATIONS WITH PREDICTED GROUNDWATER CONCENTRATIONS FOR TOXAPHENE, DIELDRIN, AND CHLORDANE

	Risk Evaluation Criteria		Ground Water Impact Evaluation	
Pesticide	Water Quality Criteria*	Risk Factor	Residual Soil Pesticide Concentration After Remediation	Resulting Pesticide Concentrations in Water in Alluvial Aquifer at the Site Boundary (ng/l) After 50 Years
Toxaphene	71.0 ng/l	10^{-4}	1 ppm	12.0
	7.1 ng/l	10^{-5}	3 ppm	35.0
	0.71 ng/l	10^{-6}	5 ppm	60.0
			10 ppm	120.0
Dieldrin	4.6 ng/l	10^{-5}	1 ppm	5.3×10^{-17}
	0.46 ng/l	10^{-6}	3 ppm	1.6×10^{-16}
			5 ppm	2.6×10^{-16}
			10 ppm	5.2×10^{-16}
Chlordane	0.71 ng/l	10^{-5}	1 ppm	4.4×10^{-4}
	0.071 ng/l	10^{-6}	3 ppm	1.3×10^{-3}
			5 ppm	2.2×10^{-3}
			10 ppm	4.4×10^{-3}

* This term represents a non-regulatory, scientific assessment of ecological and public health effects of the pollutant in any body of water, including groundwater. ("Ambient water quality criteria for Toxaphene", EPA Document No. 440/5-80-076, October 1980).

Proposed Pollutant Limit Value - Based on the above analysis, the 3.0 ppm cleanup level for total pesticides will provide a conservative, yet realistic, level of cleanup for the Woodbury site. However, due to the significant hazards posed by aldrin and dieldrin, limit values were set for these pesticides. The literature shows a 1.0 ppm non-lethal biological activity level for aldrin. Comparable data are not available for dieldrin, but because it is considered more toxic than aldrin, a limit value of 0.5 ppm has been set for this pesticide. The same limit value has been set for aldrin because it breaks down to dieldrin. Limit values have not been set for the remaining pesticides as long as the total soil concentration does not exceed 3 ppm.

Alternatives Evaluation

Based on the selected PLV, the following objectives have been developed for this site:

1. To minimize the potential for human or wildlife contact with contaminants at the site.
2. To minimize the potential for the contamination of surface waters and surface sediments in the drainage ditches at and adjacent to the site. Contamination of the off-site ditches is caused by release of pesticides from the CERCLA site.
3. To minimize the actual or potential downward migration of pesticides into alluvial ground water.

With the exception of the No Action alternative, source control alternatives involve actions (capping and landfill) that would require land-use restictions and continued monitoring programs in compliance with RCRA regulations, and long-term operation and maintenance. The contaminated soils and sediments are considered to be RCRA wastes and must be dealt with according to RCRA regulations. Source removal alternatives involving permanent cleanup solutions would not require major land-use restrictions, long-term monitoring, nor long-term operations and maintenance. The following alternatives were considered:

1. No action
2. Land use restrictions/continued monitoring only

3. Regrade and revegetate only

4. Excavate ditch and pond as necessary and dispose offsite/RCRA clay cap/revegetate

5. Excavate ditch and pond as necessary and dispose onsite/RCRA clay cap/revegetate

6. Excavate rubble and contaminated soils 6 to 10 inches, ditch, and pond as necessary/incinerate/backfill/revegetate

7. Excavate site (30 foot depth), ditch, and pond as necessary/incinerate/backfill/revegetate

8. Excavate rubble and contaminated soils 6 to 10 inches (up to 10 feet in isolated areas), ditch, and pond as necessary/dispose offsite/replace with clean material/revegetate

9. Excavate site (30 foot depth), ditch, and pond as necessary/dispose offsite/replace with clean material/revegetate

10. Construct RCRA onsite landfill on site/excavate soils and ditch and pond as necessary and dispose onsite/clay cap/revegetate

11. Excavate off site ditch and pond as necessary and dispose onsite/biological in-situ treatment/RCRA clay cap

Off-site disposal alternatives (Alternatives 4, 8, and 9) include landfill disposal and incineration of contaminants. The alternatives listed above were screened in accordance with 40 CFR Part 300.68 (h), in order to reduce the list of potential remedial actions for further detailed analysis. The criteria used in the initial screening process included: (1) total system costs, considering net present value of capital as well as operation and maintenance costs; (2) effects of the alternative upon the environment with evaluation of whether the alternative will achieve source control and mitigate threats to public health, welfare, and the environment; and (3) acceptable engineering practices with respect to feasibility and reliability for addressing the problem.

Using these criteria, a number of the alternatives were eliminated. Alternatives No. 2 and 3 were eliminated because they would not provide adequate environmental or public health protection, adequate source control, nor mitigate offsite migration of contaminants. They also would not provide a reliable means of addressing the problem, thus not meeting the requirements of CERCLA. Alternative 4 was eliminated because it would be more costly than Alternative 5 without providing a significant increase

in protection. Alternatives 7 and 9 were eliminated because they would be much more costly than Alternatives 6 and 8, respectively, without affording a significant increase in protection, mainly because all available data indicate that severe contamination occurs near or at the site surface, with only trace amounts detected in subsurface soils. Alternative 11 was eliminated primarily because its selection would be inconsistent with the National Contingency Plan (NCP) requirements regarding the use of demonstrated technology. To date, this technology has not been proven to be effective for a complex mixture of pesticides. Therefore, Alternatives 1, 5, 6, 8, and 10 were retained for futher detailed analysis. Alternative 1 is the no action alternative. Alternatives 5 and 10 are on-site source control measures, Alternative 8 is an off-site disposal alternative, and Alternative 6 is an on-site source destruction alternative.

The remaining alternatives (Alternatives 1, 5, 6, 8 and 10) were subjected to a detailed analysis using the criteria outlined in 40 CFR 300.68 (i). The main factors used to evaluate remaining alternatives are: (1) the use of established technology; (2) cost estimation including distribution of costs over time; (3) engineering implementation and constructability; (4) the extent to which the alternative is expected to effectively mitigate and minimize damage to, and provide adequate protection of, public health, welfare, and the environment, relative to the other alternatives analyzed; and (5) environmental impacts of the alternative, as well as methods and costs for mitigating those impacts.

The no action alternative (Alternative 1) is not considered acceptable because of potential adverse health and environmental impacts. Existing data indicate releases to surface and ground water which may increase as contaminants are slowly leached from the source piles. The rubble piles are not vegetated indicating toxic reactions to plants. Selection of this alternative would therefore not prevent human, animal, or plant life exposure to contaminants, and would allow continual release of contaminants into the food chain, surface, or ground water.

After screening, four design alternatives (Alternatives 5, 6, 8, and 10) were developed for detailed analysis. However, two additional

modifications to Alternative 8 were considered, resulting in six final alternatives. For each alternative, a descriptive figure is provided showing conceptual design features, a task flow diagram, and a summary of material moved, construction costs, and operation and maintenance (O&M) costs. Each cost includes $231,000 for design and Corps supervision. A brief description is provided below.

Alternative A: RCRA Cap - This alternative involves excavation of 1,100 cy of contaminated soils (500 cy) and ditch sediments (on-site ditches = 250 cy; off-site ditches = 350 cy) and consolidating all contaminants within a 400-foot by 125-foot (50,000 ft^2) area. A RCRA cap consisting of 2 feet of compacted clay, a flexible membrane liner (FML), and 2.5 feet of natural soils would be constructed over the contaminated zone. Imported fill would be required to backfill excavated areas, and provide the clay and soil portions of the cap. Site drainage would be enhanced to prevent ponding and directed flow which could result in excessive erosion. Figure 3 presents the construction sequence, along with summaries of quantities of contaminated soils to be removed, and import fill requirements. The present value cost for this alternative is $1,150,700 including $252,000 for 30 years of monitoring and site maintenance.(1)

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(1) Monitoring and Site Maintenance - RCRA requires the following monitoring program:
- o Monitor a background (upgradient) well quarterly for one year.
- o Monitor three downgradient wells semi-annually for 30 years, which would require installation of two additional wells.
- o Monitor leachate collection system (RCRA landfill) semi-annually for 30 years.

Site maintenance will include fertilization and mowing of the vegetation to assure complete revegetation and to prevent excessive vegetative growth which could hamper site drainage.

The cost for monitoring and site maintenance for each RCRA alternate are summarized below:

	RCRA Landfill		RCRA Cap	
	Monitor	Maintenance	Monitor	Maintenance
First Year	$ 27,600	$ 5,000	$ 26,600	$ 5,000
2nd through 30th yr.	104,400	145,000	75,400	145,000
TOTAL COST	$132,000	$150,000	$102,000	$150,000

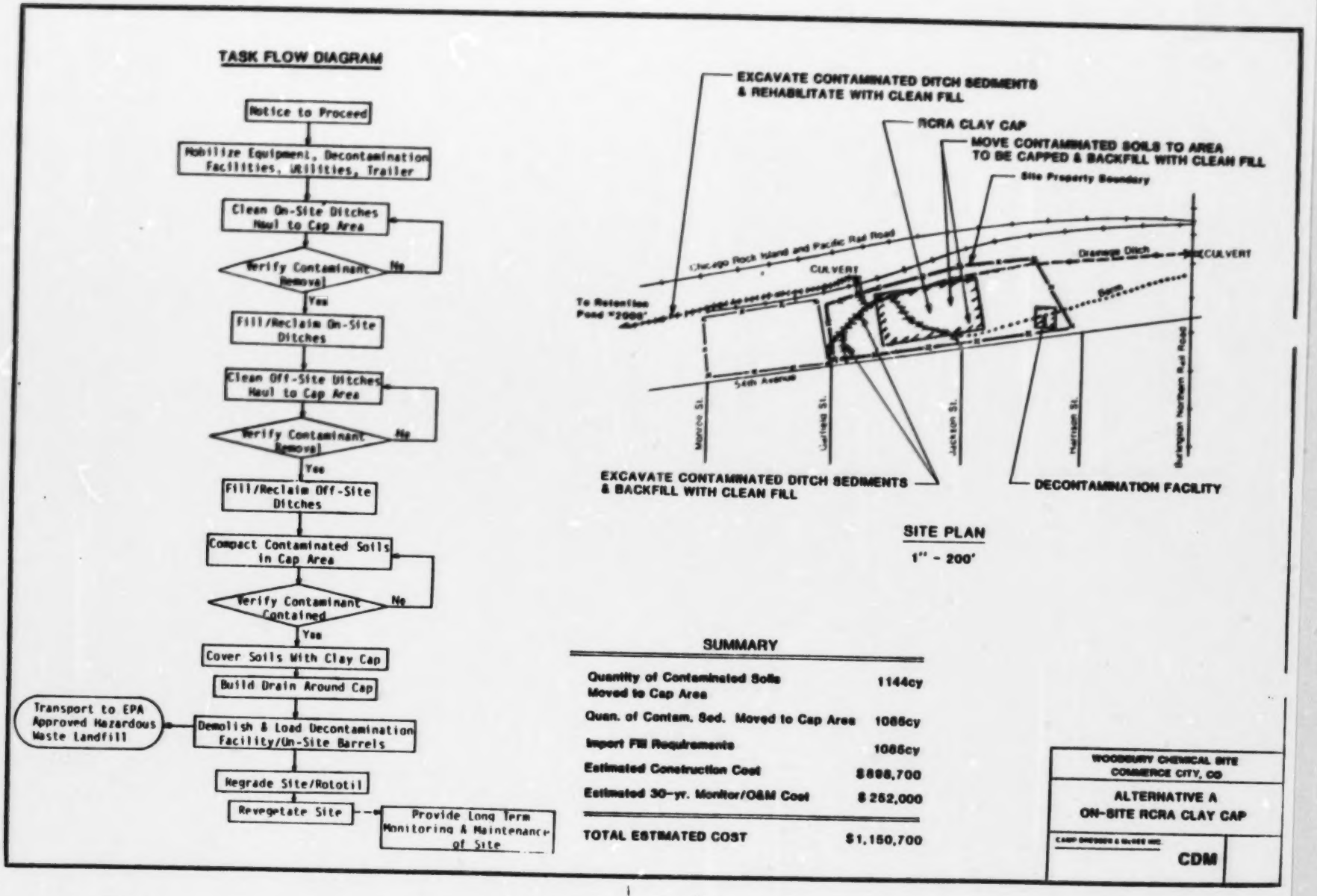

Figure 3 Alternative A On-Site RCRA Clay Cap

Alternative B: RCRA Landfill - This alternative involves construction of a 20,000 square feet (100-ft by 200-ft), double-lined RCRA landfill. All contaminated soils and ditch sediments would be excavated, transported to the landfill, compacted in place, and the entire landfill then covered with A RCRA cap. Imported fill would be required to construct the lower clay barrier of the landfill, the clay portion of the RCRA cap, and to provide fill for areas where excavation of the contaminated soil occurs. Site grading would be designed to prevent ponding on or adjacent to the landfill. Figure 4 presents construction sequences and quantity estimates.

The estimated present value cost for this alternative is $1,542,000 including $282,000 for 30 years of monitoring and site maintenance.(1)

Alternative C: Offsite Disposal - The off-site disposal alternative (Figure 5) requires that all contaminated soils and ditch sediments be excavated and transported to an EPA-approved hazardous waste landfill. Three such landfills have been identified within a 1,000-mile radius of the Woodbury site, including landfills in Nevada, Idaho, and Louisiana. The contaminated soils would be transported in bulk in Department of Transportation (DOT) approved vehicles permitted for hazardous waste transport. Imported fill would be required to reclaim the site and ditches. An estimated cost of $2,313,000 would be required for this alternative, including $21,000 for operation and maintenance.(2)

Alternative D: Offsite Incineration of Rubble Offsite Disposal of Remaining Contaminated Soils - This alternative (Figure 6) provides for destruction of the most highly contaminated rubble by transporting to an EPA-approved incineration facility and incineration of the waste. The remaining soils and ditch sediments, and site reclamation would be handled

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(2) Monitoring and Site Maintenance - For the disposal or destruction alternatives (Alternatives C through F) monitoring and site maintenance requirements will be limited to a three year period to: 1) verify that no additional ground water contamination is occuring and 2) to assure that the revegetative efforts take hold. The cost for this effort is $2,000/year for monitoring and $5,000/year for site maintenance, a total cost of $21,000 for the first three years after remediation.

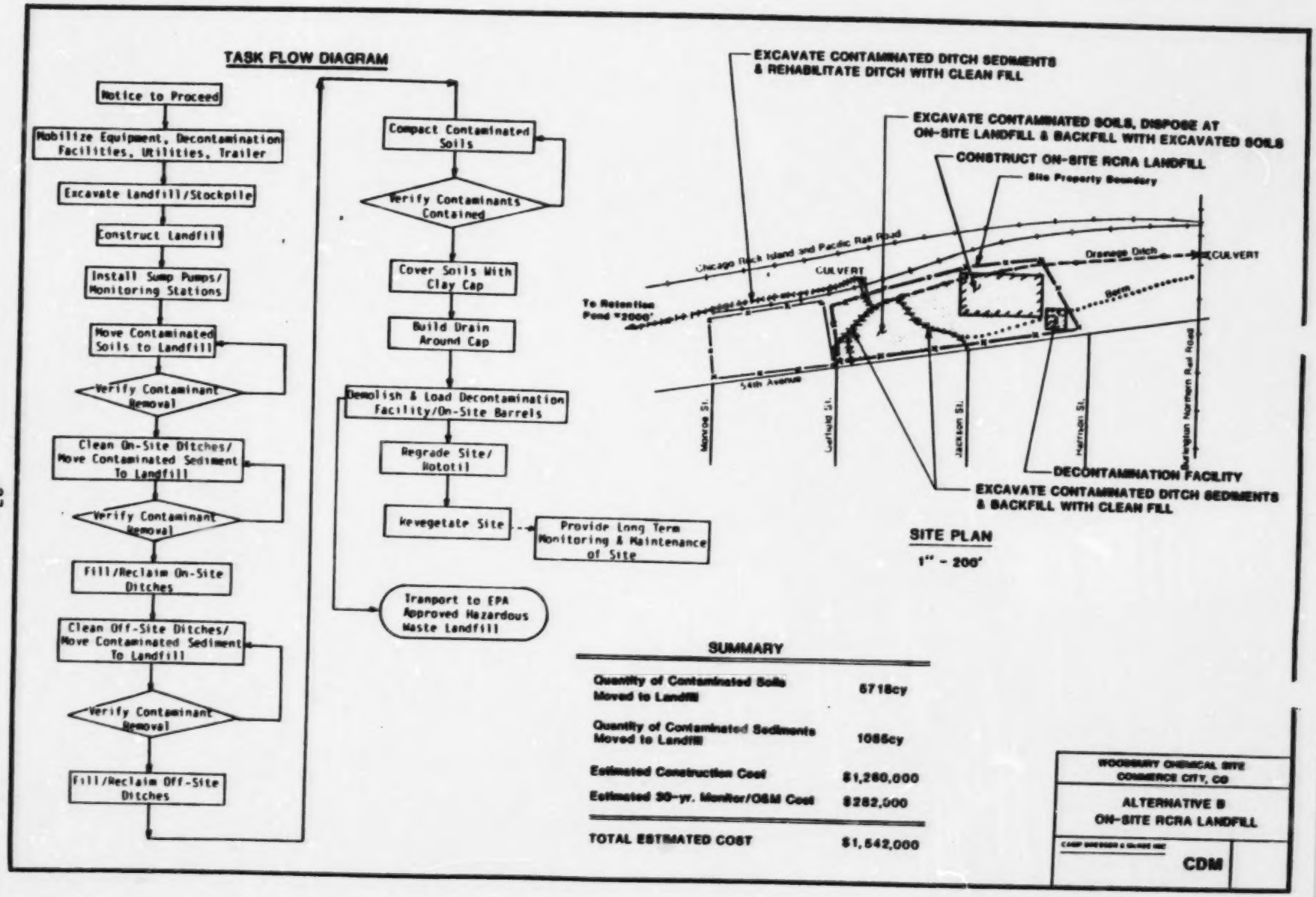
TASK FLOW DIAGRAM
Notice to Proceed
Mobilize Equipment, Decontamination Facilities, Utilities, Trailer
Excavate Landfill/Stockpile
Construct Landfill
Install Sump Pumps/ Monitoring Stations
Move Contaminated Soils to Landfill
Verify Contaminant Removal
Clean On-Site Ditches/ Move Contaminated Sediment To Landfill
Verify Contaminant Removal
Fill/Reclaim On-Site Ditches
Clean Off-Site Ditches/ Move Contaminated Sediment To Landfill
Verify Contaminant Removal
Fill/Reclaim Off-Site Ditches
Compact Contaminated Soils
Verify Contaminants Contained
Cover Soils With Clay Cap
Build Drain Around Cap
Demolish & Load Decontamination Facility/On-Site Barrels
Regrade Site/ Rototil
Revegetate Site
Provide Long Term Monitoring & Maintenance of Site
Tranport to EPA Approved Hazardous Waste Landfill
EXCAVATE CONTAMINATED DITCH SEDIMENTS & REHABILITATE DITCH WITH CLEAN FILL
EXCAVATE CONTAMINATED SOILS, DISPOSE AT ON-SITE LANDFILL & BACKFILL WITH EXCAVATED SOILS
CONSTRUCT ON-SITE RCRA LANDFILL
Site Property Boundary
Chicago Rock Island and Pacific Rail Road
CULVERT
Drainage Ditch
To Retention Pond "2000"
54th Avenue
Monroe St.
Garfield St.
Jackson St.
Harrison St.
Burlington Northern Rail Road
DECONTAMINATION FACILITY
EXCAVATE CONTAMINATED DITCH SEDIMENTS & BACKFILL WITH CLEAN FILL
SITE PLAN
1" - 200'
SUMMARY
Quantity of Contaminated Soils Moved to Landfill 5718cy
Quantity of Contaminated Sediments Moved to Landfill 1085cy
Estimated Construction Cost $1,260,000
Estimated 30-yr. Monitor/O&M Cost $282,000
TOTAL ESTIMATED COST $1,542,000
WOODBURY CHEMICAL SITE
COMMERCE CITY, CO
ALTERNATIVE B
ON-SITE RCRA LANDFILL
CDM

Figure 4 Alternative B On-Site RCRA Landfill

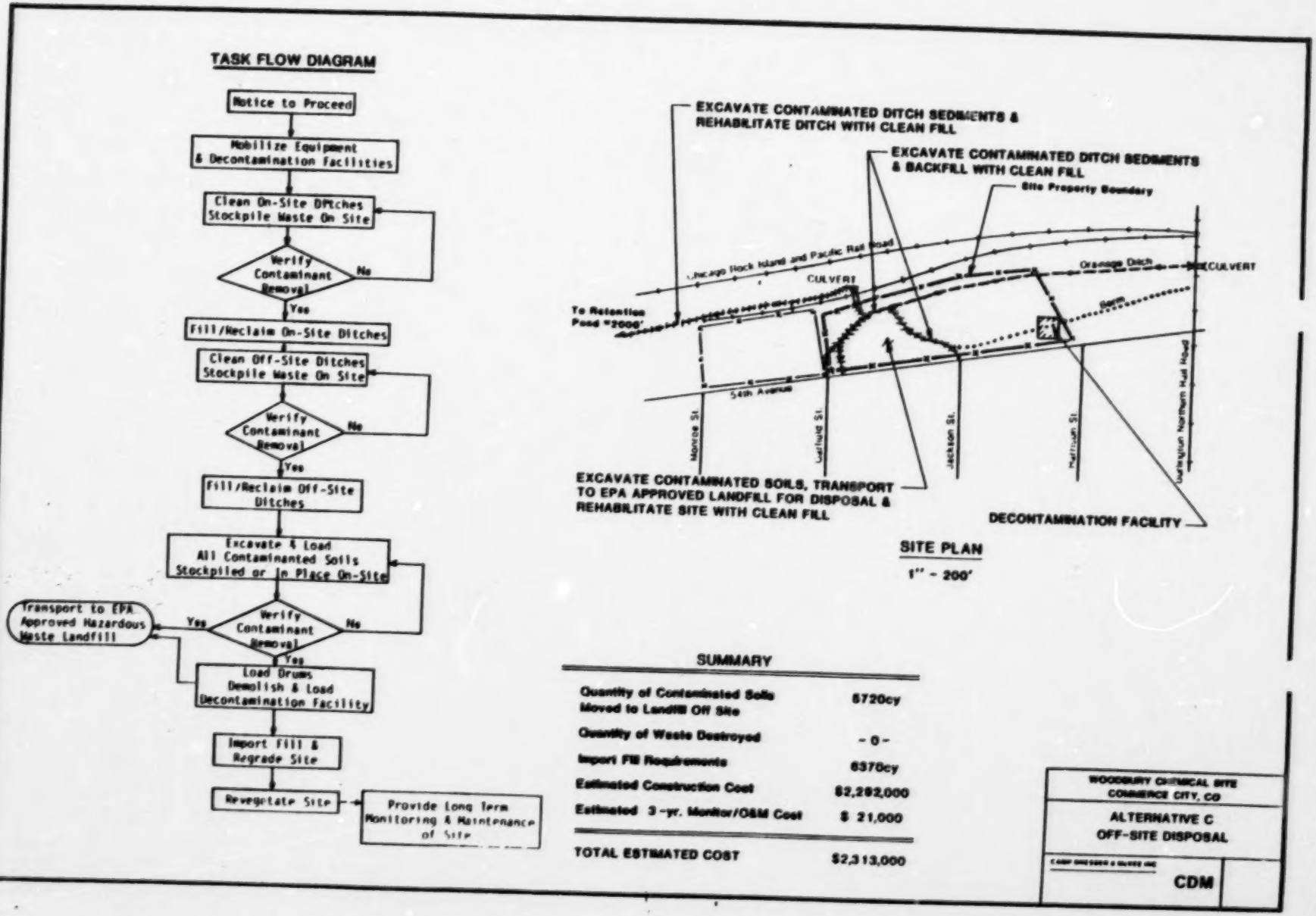

Figure 5 Alternative C Off-Site Disposal

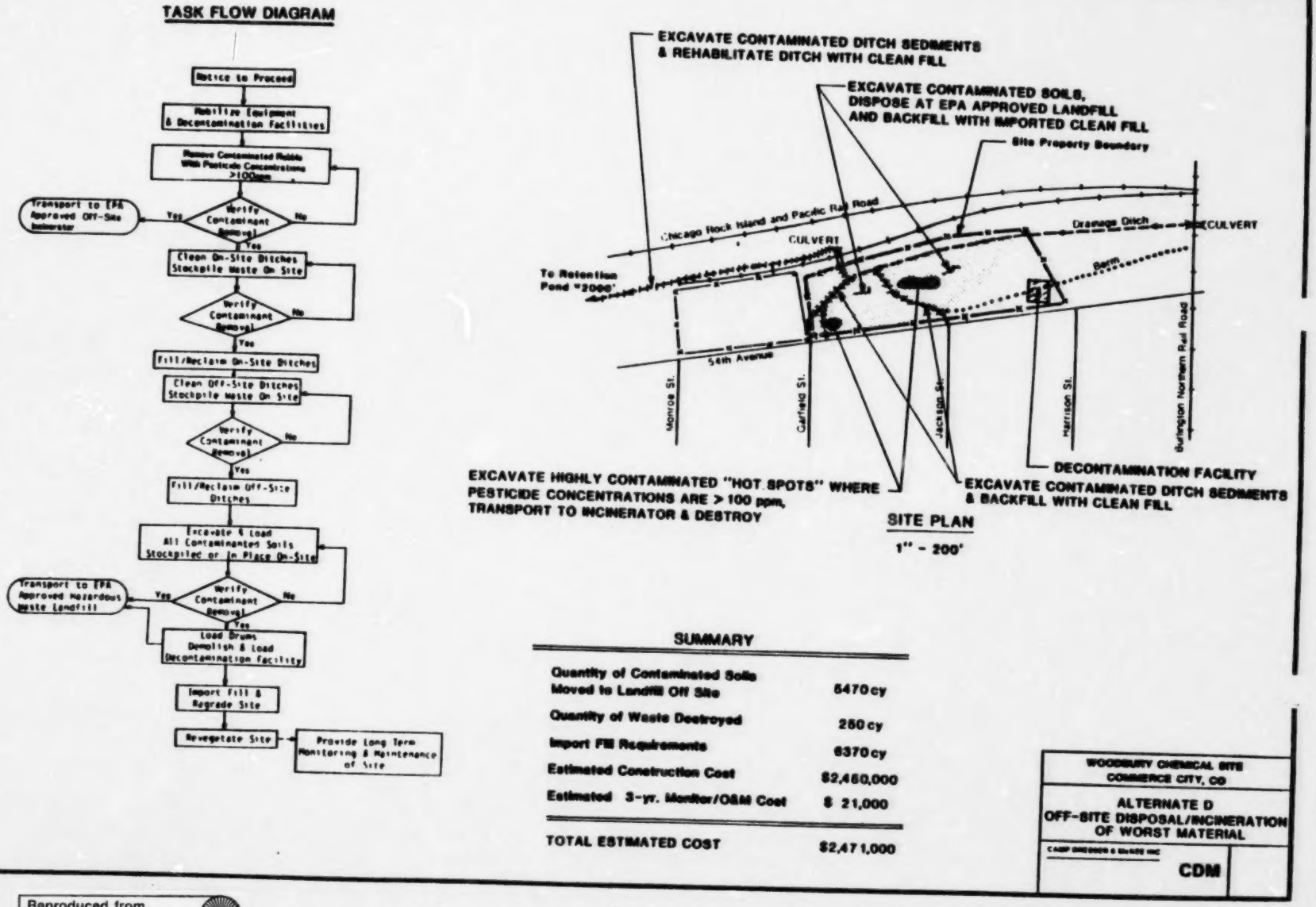
TASK FLOW DIAGRAM
Notice to Proceed
Mobilize Equipment & Decontamination Facilities
Remove Contaminated Rubble With Pesticide Concentrations >100ppm
Verify Containment Removal
Yes
No
Transport to EPA Approved Off-Site Incinerator
Clean On-Site Ditches Stockpile Waste On Site
Verify Containment Removal
Fill/Reclaim On-Site Ditches
Clean Off-Site Ditches Stockpile Waste On Site
Verify Containment Removal
Fill/Reclaim Off-Site Ditches
Excavate & Load All Contaminanted Soils Stockpiled or In Place On-Site
Transport to EPA Approved Hazardous Waste Landfill
Verify Containment Removal
Load Drums Demolish & Load Decontamination Facility
Import Fill & Regrade Site
Revegetate Site
Provide Long Term Monitoring & Maintenance of Site
EXCAVATE CONTAMINATED DITCH SEDIMENTS & REHABILITATE DITCH WITH CLEAN FILL
EXCAVATE CONTAMINATED SOILS, DISPOSE AT EPA APPROVED LANDFILL AND BACKFILL WITH IMPORTED CLEAN FILL
Site Property Boundary
Chicago Rock Island and Pacific Rail Road
CULVERT
Drainage Ditch
CULVERT
To Retention Pond "2000"
Berm
54th Avenue
Monroe St.
Garfield St.
Jackson St.
Harrison St.
Burlington Northern Rail Road
DECONTAMINATION FACILITY
EXCAVATE HIGHLY CONTAMINATED "HOT SPOTS" WHERE PESTICIDE CONCENTRATIONS ARE > 100 ppm, TRANSPORT TO INCINERATOR & DESTROY
EXCAVATE CONTAMINATED DITCH SEDIMENTS & BACKFILL WITH CLEAN FILL
SITE PLAN
1" - 200'
SUMMARY
Quantity of Contaminated Soils Moved to Landfill Off Site 5470 cy
Quantity of Waste Destroyed 250 cy
Import Fill Requirements 5370 cy
Estimated Construction Cost $2,460,000
Estimated 3-yr. Monitor/O&M Cost $ 21,000
TOTAL ESTIMATED COST $2,471,000
WOODBURY CHEMICAL SITE
COMMERCE CITY, CO
ALTERNATE D
OFF-SITE DISPOSAL/INCINERATION OF WORST MATERIAL
CDM

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Figure 6 Alternative D Off-Site Disposal/Incineration of Worst Material

identically to Alternative C. The estimated present value cost for this alternative is $2,471,000 including $21,000 for monitoring and site maintenance.(2)

Alternative E: Offsite Incineration - Offsite incineration, presented schematically on Figure 7, follows the same construction sequence as Alternative C. The contaminated soils and ditch sediments would instead be transported to an EPA-approved incinerator facility. At this time, only one such facility within an 1,100-mile radius of the site is equipped to handle contaminated soils in bulk. This facility is the ENSCO incinerator in El Dorado, Arkansas. The estimated present value cost for this alternative is $9,158,000 including $21,000 for monitoring and site maintenance.

Alternative F: Onsite Incineration - This alternative utilizes a mobile soil incinerator, located onsite (Figure 8). Contaminated soils and ditch sediments would be excavated, incinerated, and the residue utilized for backfill. At this time, other than the EPA mobile incinerator, only one mobile incinerator is in operation with a limited permit for hazardous waste incineration. This unit is operated by ENSCO at El Dorado, Arkansas. The estimated present value cost for this alternative is $5,613,000 including $21,000 for monitoring and site maintenance.(2)

Community Relations

Community interest in the project has been very limited through June 1985. The three week public comment period for the Feasibility Study and Alternative Selection (March 11 - April 1, 1985) did not generate a single comment from any members of the public. Fact sheets were mailed to persons identified in EPA's Community Relations Plan, and a newspaper article as well as a public notice were published in a major local newspaper to draw attention to the public comment period. The only interest generated came from a few surrounding industries that were interested in receiving copies of the final RI and the draft FS. Those copies were mailed out, and no further comments were received.

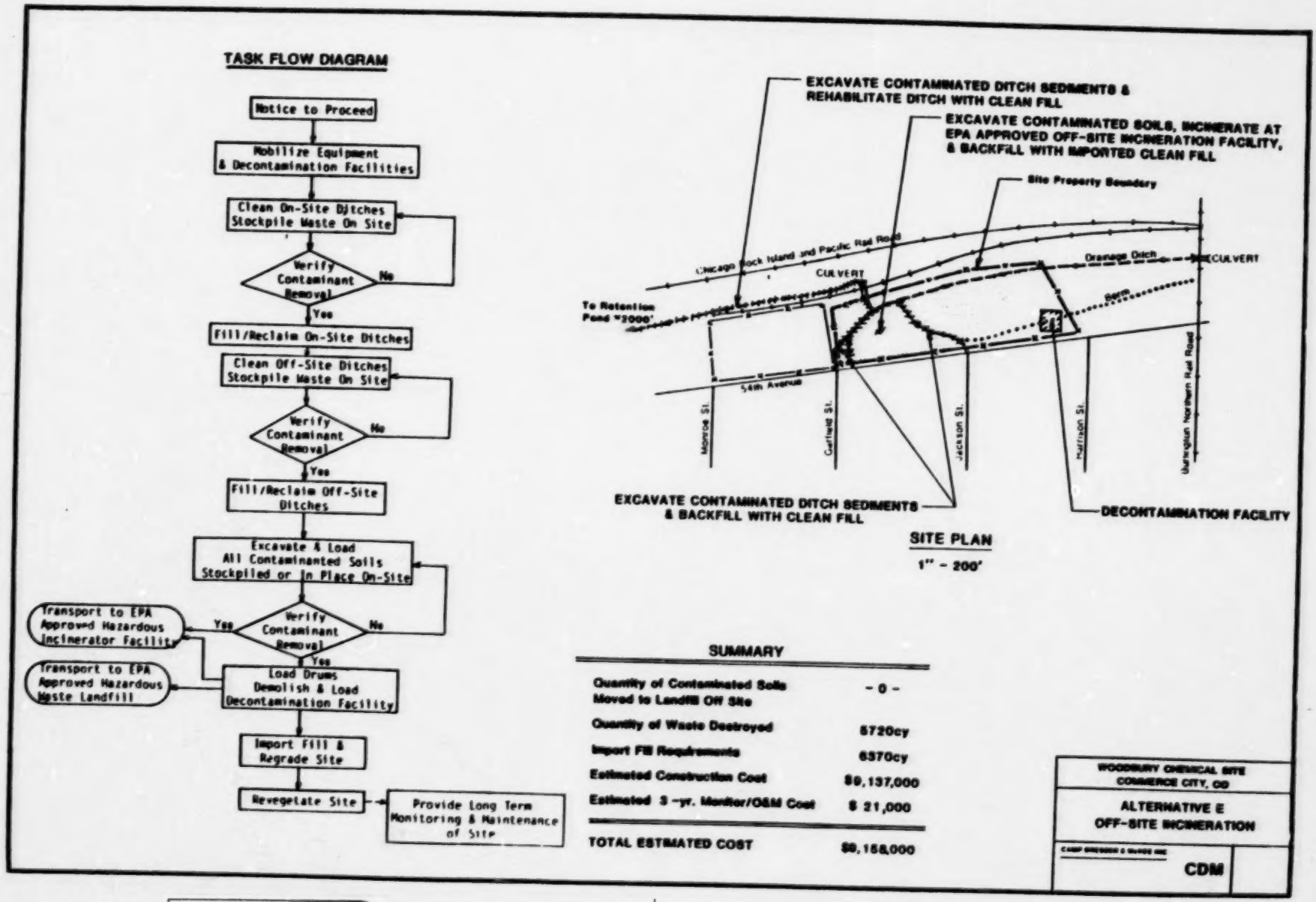
TASK FLOW DIAGRAM
Notice to Proceed
Mobilize Equipment & Decontamination Facilities
Clean On-Site Ditches Stockpile Waste On Site
Verify Contaminant Removal
No
Yes
Fill/Reclaim On-Site Ditches
Clean Off-Site Ditches Stockpile Waste On Site
Verify Contaminant Removal
No
Yes
Fill/Reclaim Off-Site Ditches
Excavate & Load All Contaminanted Soils Stockpiled or In Place On-Site
Verify Contaminant Removal
Yes
No
Yes
Transport to EPA Approved Hazardous Incinerator Facility
Transport to EPA Approved Hazardous Waste Landfill
Load Drums Demolish & Load Decontamination Facility
Import Fill & Regrade Site
Revegetate Site
Provide Long Term Monitoring & Maintenance of Site
EXCAVATE CONTAMINATED DITCH SEDIMENTS & REHABILITATE DITCH WITH CLEAN FILL
EXCAVATE CONTAMINATED SOILS, INCINERATE AT EPA APPROVED OFF-SITE INCINERATION FACILITY, & BACKFILL WITH IMPORTED CLEAN FILL
Site Property Boundary
Chicago Rock Island and Pacific Rail Road
CULVERT
Drainage Ditch
CULVERT
To Retention Pond "2000'
Berm
54th Avenue
Monroe St.
Garfield St.
Jackson St.
Harrison St.
Burlington Northern Rail Road
EXCAVATE CONTAMINATED DITCH SEDIMENTS & BACKFILL WITH CLEAN FILL
DECONTAMINATION FACILITY
SITE PLAN
1" - 200'
SUMMARY
Quantity of Contaminated Soils Moved to Landfill Off Site - 0 -
Quantity of Waste Destroyed 5720cy
Import Fill Requirements 6370cy
Estimated Construction Cost $9,137,000
Estimated 3 -yr. Monitor/O&M Cost $ 21,000
TOTAL ESTIMATED COST $9,158,000
WOODBURY CHEMICAL SITE COMMERCE CITY, CO
ALTERNATIVE E OFF-SITE INCINERATION
CDM

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Figure 7 Alternative E Off-Site Incineration

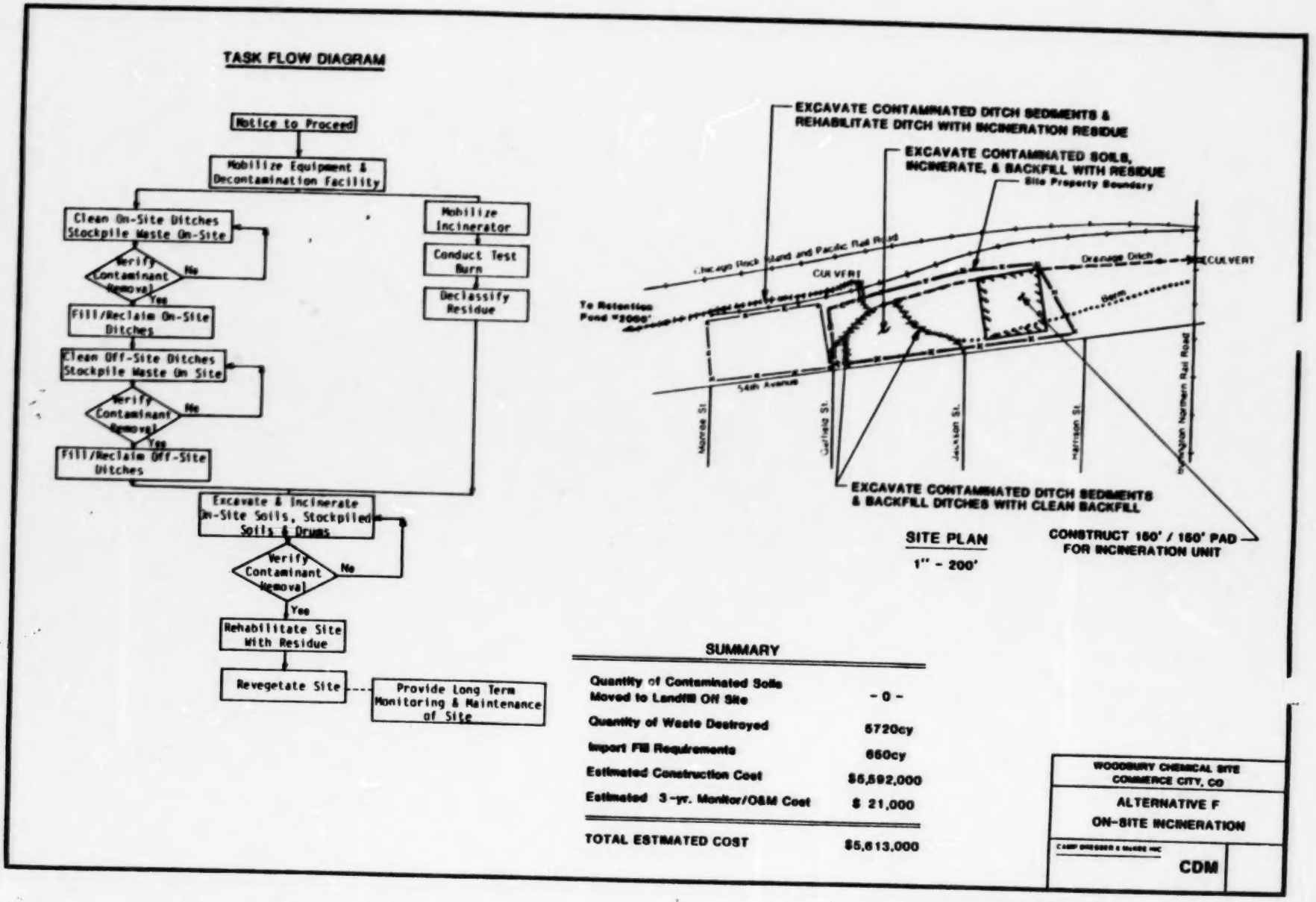


Figure 8 Alternative F On-Site Incineration

Community and agency interest may increase during mid-1985 as the ROD documents are finalized and a remedial action is initiated. A revised mailing list of local, state, and federal agency contacts, local industries, interested nearby residents, and others will be developed, and periodic mailings by EPA will be instituted to inform these parties of site activities. This coordination and information transfer is especially important in view of the proposed NCP revisions (February 12, 1985, 50 FR 5862-5932) concerning permitting and community relations for CERCLA sites (see especially 50 FR 5866, 5904). A public meeting is planned to brief citizens and officials on the selected alternative for the final remedy at the site.

Consistency with Other Environmental Laws

All of the alternatives considered in detail would fully comply with applicable Federal, State, and local environmental laws. EPA's off-site policy (1985) requires that any off-site disposal utilize only fully permitted RCRA facilities in good RCRA standing. The selected alternative will be implemented in full compliance with this policy. This compliance includes Clean Air Act, Colorado laws (hazardous wastes, air emissions, etc.) and local laws (landfill license). The off-site disposal alternatives would also comply with Department of Transportation regulations concerning the transport of hazardous wastes. The incineration alternative would comply with Clean Air Act criteria. The recommended alternative, described below will fully comply with all applicable environmental laws. No waivers of compliance with other laws will be required for the selected alternative. No alternative concentration limits, as established by regulations, are sought.

The areawide ground water contamination problem (principally TCE) will be addressed under several other NPL listings in the area, or possibly under new site listings. EPA feels that it would be inappropriate to consider mitigation of ground water TCE contamination under the Woodbury listing because there is no evidence that the Woodbury site is a contributing source of TCE. The recommended alternative would alleviate continuation of the existing pesticide contamination problem beneath the site.

Recommended Alternative

According to 40 CFR Part 300.68(j), cost-effective is described as the lowest cost alternative that is technically feasible and reliable and which effectively mitigates and minimizes damages to and provides adequate protection of public health, welfare, and the environment. Evaluation of the six remedial alternatives (Table 6) leads to the conclusion that Alternative D is the most cost-effective in terms of elimination of contaminants and long-term protection of human health.

EPA believes that, of the remaining alternatives, two (A and B) were felt to be deficient in their ability to minimize actual or potential long-term hazards at the site due to potential ground water fluctuations, did not destroy contaminants, and required long-term monitoring. The slightly higher cost of the selected alternative over Alternative C is justified under the NCP because of the significantly higher environmental benefit associated with destruction of the most contaminated material. Alternatives E and F were eliminated because of significantly higher costs to allow only 28% more contaminant destruction.

Alternative D uniquely brings together the key selection criteria recognized by the NCP:

- o Total System Costs - Alternative D represents a total cost of $2,471,000 which is 160% of the cost of the least expensive acceptable alternatives (RCRA Landfill).
- o Environmental and Public Health Effects
  - Removal of source and 99.5% of all site contaminants
  - 72% of waste on-site destroyed
  - Cancer risk to population for all pesticides other than toxaphene is significantly less than the 10^{-6} risk level
  - The estimated concentration of toxaphene in groundwater resulting from a 3 ppm soil pesticide concentration is 35 ng/l, which is two orders of magnitude less than RCRA standard of 0.005 mg/l.
  - Cancer risk for toxaphene in ground water after 50 years exceeds the 10^{-5} risk level, but is below the 10^{-4} risk limiting level.
  - Achieving a 10^{-6} cancer risk level for toxaphene is not technically practical since excavation of up to 20 feet across the site would be required
  - Residual pesticide concentration reflect "typical" background levels in western urban areas

Table 6

SUMMARY OF EVALUATION

Alternative	Cost ($ million) Capital	Present Worth	Public Health/ Welfare Concerns	Environmental Concerns	Technical Concerns	Regulation Compliance Concerns	O&M Considerations	Alternative Category
0. No Action	-	-	High potential for direct contact of waste by surrounding populace	Continued off-site migration of waste material. Possible cancer risk from ground water exposure in excess of 10^{-4} level.	-	Does not comply with CERCLA	-	5
A. On site RCRA Cap/Disposal of soils, rubble and sediments on site under clay cap	0.898	1.151	Reduces potential for off-site migration and public contact. Release still possible due to ground water fluctuation	Downward movement to ground water still possible. All waste remains on site. Possible cancer risk from ground water exposure in excess of 10^{-4} level.	Excavation of drainage ditch behind the Foremost-McKesson Company may be difficult due to limited access. Clay cap cannot be constructed during the winter months. All cap materials must be imported.	Certificate of designation from Board of County Commissioners may be required since wastes will be stored on site.	Continued O&M on the cap to ensure its integrity. Long-term monitoring required.	4
B. RCRA Landfill/ Disposal of soils, rubble and sediments on site within RCRA landfill.	1.260	1.542	Greatly reduces the potential for human contact with the waste material. Land use restrictions will be required to protect the landfill.	Greatly reduces the potential for off-site migration of waste material. Waste remains on site.	Staging of construction may be required due to limited space available on site. All materials required need to be imported.	Complies with RCRA and CERCLA policies. Certificate of designation from the Board of County Supervisors may be required.	Continued O&M on the cap to ensure its integrity. Inspection and clean-out as necessary of leachate collection system. Long-term monitoring required.	2,3
C. Off-site Disposal/ Excavation, transport, and disposal of soils, rubble, sediment in approved landfill.	2.292	2.313	Greatly reduces the potential for human contact with waste on site. Potential for spill and contact with waste during transport. Waste will remain at approved landfill.	Population risk to cancer from ground water exposure reduced to less than 10^{-6} level for all contaminants except toxaphene. Some potential for release of toxaphene after 50 years at 10^{-5} risk level	Excavation of ditch may be difficult (see A). Import fill required for site reclamation.	Must comply with all DOT regulations. Disposal must be in RCRA Landfill.	O&M will be limited. Monitoring only necessary for 3 years.	1

Table 6

SUMMARY OF EVALUATION (Continued)

Alternative	Cost ($ million) Capital	Present Worth	Public Health/ Welfare Concerns	Environmental Concerns	Technical Concerns	Regulation Compliance Concerns	O&M Considerations	Alternative Category
D. Off-site incineration of rubble. Off-site disposal of contaminated soils and sediments.	2.450	2.471	Greatly reduces the potential for human contact with waste on site. Potential for spill and contact during transportation. 72% of waste destroyed. 27.5% of waste disposed in approved landfill.	Population risk to cancer from ground water exposure reduced to less than 10^{-6} level for all contaminants except toxaphene. Some potential for release of toxaphene after 50 years at 10^{-5} risk level.	(See C) Analytical support required to separate highly contaminated materials for incineration.	Must comply with all DOT regulations. Incineration must be performed in approved incinerator. Disposal must be in RCRA landfill.	O&M will be limited. Monitoring only necessary for 3 years.	1
E. Off-site incineration/ Excavation, transport, and off-site incineration.	9.137	9.158	Greatly reduces potential for human contact with waste on site. All waste destroyed to 3 ppm level - 99.5% of all wastes. Potential for spill and contact during transport.	Population risk to cancer from ground water exposure reduced to less than 10^{-6} level for all contaminants except toxaphene. Some potential for release of toxaphene after 50 years at a 10^{-5} risk level.	See C	Must comply with all DOT regulations. Must be burned in approved incinerator.	O&M will be limited. Monitoring only necessary for 3 years.	1
F. On site incineration/ Excavation, burning, and backfilling of all contaminated materials.	5.592	5.613	Greatly reduces potential for human contact with waste on site. All waste destroyed to 3 ppm level - 99.5% of waste on site. Offers greatest potential for long-term public health protection.	Population risk to cancer from ground water exposure reduced to less than 10^{-6} level for all contaminants except toxaphene. Some potential for release of toxaphene after 50 years at a 10^{-5} risk level. Slight degradation of air quality at site during incineration.	See C. Mobile incinerator may not be available. Outside service agencies limited.	Air pollution emission notice and permit from the Air Pollution Control Division, Colorado Department of Health required.	O&M following incineration limited. Monitoring only necessary for 3 years.	2

Table 6

SUMMARY OF EVALUATION (Concluded)

[a] The following five categories must all be covered by the remedial action alternatives:

1. Appropriate off-site disposal and/or treatment of the hazardous substances at a RCRA approved facility.
2. On site remedial action that attains all applicable and relevant Federal public health and environmental standards, guidance or advisories (10^{-4} risk level).
3. On site remedial action that exceeds all applicable or relevant Federal public health and environmental standards, guidance,or advisories (10^{-4} risk level).
4. Remedial action that does not attain applicable or relevant public health or environmental standards (10^{-4} risk level), but will reduce the likelihood of present or future threat from the hazardous substances.
5. No action.

- o Technical Feasibility - Alternative D is technically feasible. Conventional earth moving equipment and techniques would be employed, and the entire cleanup operation could be completed in less than nine months.

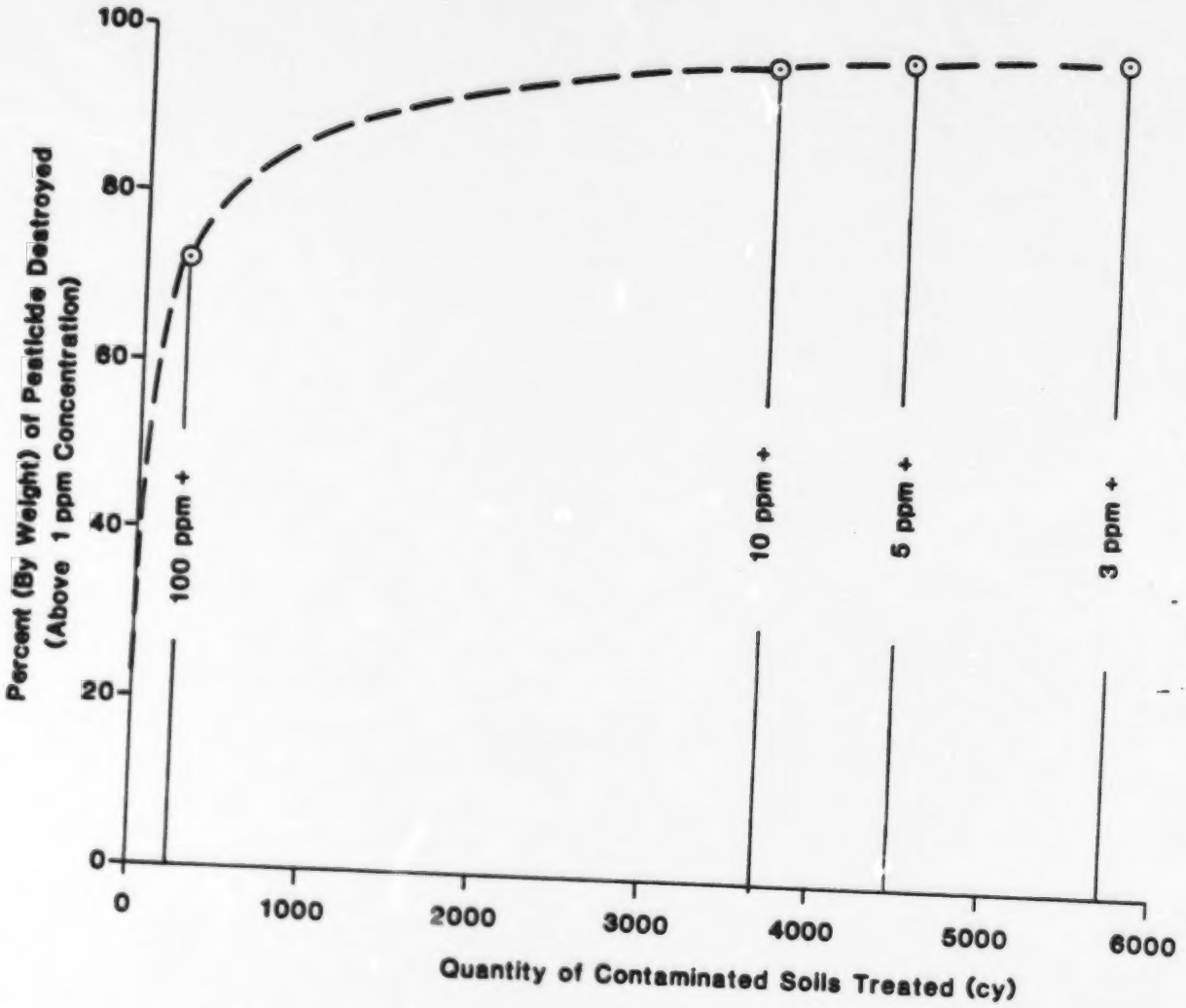
- o Institutional - No major problems are envisioned concerning permit issues and right-of-way acquisition.

Based on these criteria, Alternative D (an off-site disposal alternative) is the most cost effective based on the combination of price, environmental effects, and technical feasibility.

The components of Alternative D are technically feasible and reliable, and when combined provide the greatest level of protection for public health, welfare, and the environment. Excavation and offsite disposal of contaminated soils and wastes to a secure hazardous waste management facility or incineration facility are well established and reliable technologies. The removal of wastes from the residential/industrial setting will minimize public health threats posed by direct contact with the waste as well as minimize the release and continued degradation of the surface water, ground water, and sediments immediately offsite. The monitoring of existing onsite wells for a short term following excavation will evaluate the migration of any remnant contamination and thereby ensure the effectiveness of the onsite remedial action.

This alternative, as previously described and shown in Figure 6, involves the removal of 250 cubic yards (cy) of soil contaminated with greater than 100 ppm total pesticides. The removal and incineration of this amount of soil will result in a 72 percent destruction of the pesticides that currently exist on the Woodbury site (Figure 9). Therefore, a large quantity of contaminants will be removed from existence, and not just transported elsewhere with their hazard potential remaining.

The highly contaminated rubble is clearly identified by the distinct division in sample pesticide concentrations (no values between 80 and 100 ppm). No samples with more than 100 ppm total pesticides were observed outside of the rubble area. The quantity of rubble is clearly identified as 250 cy.



Total Pesticide Concentration Level (ppm)	Estimated Quantity of Soil Effected (cy)	Quantity of Total Pesticide Above 1 ppm Concentration Contained in Soil (lbs)
100+	250	1125
10+	3640	1511
5+	4470	1530
3+	5718	1545
1+	7398	1555

Figure 9 A Comparison of Quantity of Materials Removed With Clean-up Levels

Removal and off-site destruction of the rubble will be followed by off-site disposal of the remaining contaminated soils to a 3 ppm level. This action will (1) achieve a total reduction of over 99 percent of residual pesticides on the site; (2) provide positive protection against the future contamination of ground water through leaching of toxaphene and dieldrin - the most mobile of the contaminants; (3) provide for the destruction of the rubble source (72% of total contaminants on site); and (4) reduce remaining pesticide contamination within the soils. Calculated delivery of pollutants to the public water supply aquifer at the site boundary are well within cancer risk factor levels and within recommended water quality criteria (refer to Table 5) following completion of the remedial action.

Maintenance and Monitoring Operations

Long-term maintenance for the site is limited to an intense effort for the first three years to assure revegetation. Maintenance efforts would include fertilizing and mowing of the low water vegetation that would be selected for site reclamation. This effort would include fertilization three times during the growing season and monthly mowings during the same seven-month period. The cost for this effort is estimated at $5,000/year.

Monitoring of the ground water wells would not be required. However, to assure public health protection, a limited pesticide monitoring program of sampling the wells twice annually for a three-year period is recommended. Two of the existing monitoring wells, one each, up and down gradient, would be selected for monitoring. Monitoring should be coordinated prior to the spring recharge period (Feburary) and again after the recharge period (July-August). The cost for this effort is estimated at $2,000/year.

The total cost for monitoring and O&M is estimated at $21,000 for a three-year period.

Schedule

The following key milestone dates have been established for this project:

- Approve Remedial Action (ROD signature)	July 1985
- Award IAG for Design	July 1985
- Initiate Design	July 1985
- Award IAG for Construction	September 1985
- Complete Design	January 1986
- First Earth Movement	May 1986
- Complete Construction	August 1986

Future Actions

The areawide ground water contamination problem, particularly with respect to TCE and other solvents, will need to be addressed in a future action not related to this site. Because the problem is widespread, it will be addressed during RI/FS work associated with other Superfund sites in the area, possibly under a new NPL listing. This will be determined when and if a source of the contamination can be identified. EPA is presently involved in an aggressive PA/SI program in the general area to attempt to identify sources and quantities of contaminants. A detailed study of the South Adams County Water and Sanitation District's water supply wells is currently in progress. (See Denver Post; July 14, 1985; p. 1)

COMMUNITY RELATIONS RESPONSIVENESS SUMMARY
WOODBURY CHEMICAL SITE
COMMERCE CITY, COLORADO

INTRODUCTION

The purpose of the Responsiveness Summary is to document for the public record the following items:

1. Concerns and issues raised by the public or agencies prior to the Feasibility Study comment period
2. Comments raised and questions asked during the comment period on the Feasibility Study
3. The responses of EPA to these comments and concerns

CONCERNS RAISED PRIOR TO THE FEASIBILITY STUDY COMMENT PERIOD

A brief historical synopsis of community relations events pertaining to the Woodbury Chemical Site prior to the public comment period on the Feasibility Study is in order before addressing the concerns raised during the remedial planning process.

First, news articles in local publications in 1980 and early 1983 described the site, its potential risks, and its Superfund status.

Second, in September 1983, EPA Region VIII conducted an Immediate Removal action (IR) that included constructing a fence and posting bi-lingual warning signs around the site to restrict access. In conjunction within the IR, the EPA Project Officer and the Community Relations Coordinator visited businesses and residences near the site to explain the activities and ask about possible concerns. They also distributed bilingual (English/Spanish) fact sheets prepared by EPA to inform the public of the reason for constructing the fence. A press release was also prepared and published.

No specific concerns nor questions were raised by the public or other agencies during this 1980-1983 period.

Third, during the summer of 1984, field investigators conducted well-drilling and sampling activities on the site. No direct comments nor inquiries were received during this period.

Finally, in early 1985, a telephone inquiry about the potential effects of the site was made by a representative of an out-of-state business considering purchase of property near the site. Preliminary findings were summarized in a verbal response and no further information was required.

Comments on the Draft RI report were received from the Colorado Department of Health, Waste Management Division (January 1985) and the U.S. Army Corps of Engineers (Corps), Omaha District (March 1985). These agencies made the following comments:

- o Colorado Department of Health
  - Include more information on laboratory QA/QC and sampling plan
  - Provide details to verify and determine ground water flow rates and directions
  - Provide review and summary of historical site data in RI so that the data can be evaluated during FS
- o Corps of Engineers
  - Emphasize that pesticides and heavy metals are the main site contaminants, and characterize their general location and impacts
  - Provide action levels for pesticides and metals on site
  - Add more complete summary tables of analytical data
  - Add dioxin analysis because of nature of burned facility

EPA responded to each of these concerns in its revisions to the Draft RI.

COMMENTS AND QUESTIONS DURING THE FEASIBILITY STUDY COMMENT PERIOD

A notice was published by EPA in the Rocky Mountain News and the Commerce City Sentinel announcing the public comment period and the availability of the Feasibility Study documents. An informational newspaper article in the Rocky Mountain News accompanied the notice. The formal public comment period was then held from March 11 through April 1, 1985; however, EPA has been receptive to public comments since that time. A fact sheet summarizing the proposed remedial action alternatives was prepared and

distributed to a mailing list of public officials and interested parties at the beginning of the public comment period. Fact sheets and study documents were also made available in two public repositories. No public comments on the proposed alterntatives or study documents were received, nor were any requests made for a public meeting.

The Corps had some additional comments on the Draft FS in its March 1985 letter, as follows:

- Additional sampling is needed to add quantitative precision to remedial designs; any planned additional sampling should be discussed with the Corps
- Details concerning the drainage ditch and pond ownership, and any planned rerouting of drainage ditches around the site should be addressed
- On-site air monitoring prior to and after construction of the remedy should be planned and costed, in order to address worker health and safety concerns and off-site impacts (to both Commerce City to the north and City and County of Denver to the south)

EPA responded to these comments in the Final FS and decision documents in the following manner:

- The additional sampling was conducted by CH_2M Hill in 1985, and was described and analyzed by the REM II Team (CDM) in their technical memorandum of July 1985. This additional sampling provided the necessary data for conceptual design of the alternatives. If necessary, additional sampling will be conducted during the design phase.
- Details concerning the drainage ditch were also addressed in the REM II technical memorandum noted above
- Additional air monitoring will be incorporated during the design phase August 1985-January 1986, as noted in the REM II technical memorandum

In response to mailing list requests, EPA sent copies of the study documents to, among others, McKesson Environmental Services, Denver Shipping Company, and the Community Development Director for the City of Commerce City. Also, in order to ensure that the local press was well-informed about site details, informational copies were sent to The

Denver Post and Rocky Mountain News. EPA has since received several requests from other parties to be added to the mailing list. Further, a number of state and local agencies were contacted during June and July 1985. These agencies were informed about the project and added to the mailing list.

Local community action groups formed or became active in early 1985 to address hazardous waste concerns in Adams County. The groups urged local residents to contact EPA and other agencies about their concerns. Although the Woodbury site is in Adams County, it has received no special attention from these groups. The groups include ACTION (Adams County Together Improving Our Neighborhoods), CCAN (Colorado Citizens Action Network, affiliated with the National Campaign Against Toxic Hazards), and Adams County Residents Organization.

Finally, a Community Relations Plan has been developed and is being implemented for the Woodbury site. Follow-up contacts, newsletters, information, and (if needed) public meetings will be occurring during the next several months to respond to organized groups, affected citizens, relevant agencies, the media, and elected officials, as EPA implements remedial actions on the site.

REMAINING CONCERNS

As pointed out above, hazardous wastes and ground water contamination in the general Adams County area remain as concerns for residents. EPA is conducting an areawide ground water quality survey to determine the nature and extent of contamination and develop a remedial strategy.

ROD ISSUES ABSTRACT

Site: Woodbury Chemical, Commerce City, Colorado

Region: VIII

RA Briefing: July 18, 1985

SITE DESCRIPTION

Woodbury Chemical Company operated a pesticide manufacturing facility at 54th Avenue and Jackson in Commerce City from the late 1950's to 1965 when the facility was destroyed by fire. Fire rubble and debris containing pesticides were disposed on an adjacent empty lot which is the designated CERCLA site. More than 1,565 pounds of organochloride pesticides are present on the site. Results of remedial investigations show contaminated soils and sediments on site, contaminated sediments off site, and pesticides in the ground water below the site, however, significant contamination is limited to the rubble piles.

SELECTED ALTERNATIVE

The cost-effective remedial alternative selected for this site includes: excavation and removal of 250 cubic yards of material with total pesticide concentration in excess of 100 ppm and destruction of this material in an offsite incinerator; excavation and removal of 5,470 cubic yards of soils containing 3-100 ppm of total pesticides and disposal in an approved landfill; backfilling with clean soil, regrading, and revegetating the site; and ground water monitoring and site maintenance for a 3-year period. The total present worth cost for the alternative is $2,471,000 which includes $21,000 for a 3-year O & M period, and $211,000 for design (including Corps of Engineers review and supervision).

ISSUES AND RESOLUTIONS

1. Results of RI studies show that the majority (72%) of the contaminants are associated with rubble piles deposited on the site following the 1965 fire. Excavation, removal, and incineration of the rubble and soils with total pesticide concentrations >100 ppm will result in the complete destruction of 1,125 pounds of pesticides. Controlling (destroying) the source, 72% of the pesticides will not become a contaminant or public health risk elsewhere.

KEY WORDS

- Pesticide
- Incineration
- Public Health Risk
- Source Control

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ISSUES AND RESOLUTIONS

KEY WORDS

2. The majority of the remaining contaminants are associated with soils (surface and subsurface) and sediments immediately adjacent to or below the rubble piles, although some contaminants have moved off site in drainage sediments. Excavation, removal, and disposal to offsite landfill of soils and sediments with 3-100 ppm total pesticides will remove an additional 5,470 cubic yards of contaminated material.

- Soil
- Subsurface
- Offsite Disposal

3. A 100 ppm cutoff value was dictated for materials to be incinerated. This level was chosen because total pesticide concentrations in excess of 100 ppm were associated with rubble piles. The 3 ppm pollutant limit value for contaminated soils was based on residual soil pesticide levels in urban environments and predicted public health risk from ground water contamination.

- Remnant Contamination
- Public Health Risk
- Ground Water Contamination

4. Ground water contamination has been detected in well samples taken from below the rubble piles, but not in offsite water samples. Removal of the rubble piles will remove the major source of ground water contamination. Modeling of movement of the remaining contaminants predicts pesticides levels in the ground water below the site to be in the ng/l range, with all pesticides being below their respective ambient water quality criteria.

- Ground Water Contamination
- Ambient Water Quality Criteria
- Offsite Plume Control

5. Onsite disposal and incineration were considered as alternatives. These alternatives were deemed inappropriate because they either left contaminants on site and required long-term monitoring (RCRA cap and landfilling) or were too expensive (incineration). The offsite disposal and incineration alternative was chosen because removal and destruction of contaminants followed by backfilling and grading of the site provides the most cost effective means of providing protection of public health with the best available technology. Operations and maintenance/monitoring will only be required for a 3-year period.

- Onsite Treatment
- Offsite Disposal
- Incineration
- Monitoring
- O & M
- Capping
- Permanent Containment
- Best Available Technology
- Cost/Benefit
- Cost Estimates